1954

The Effect of Temperature and Humidity on Hearing Acuity.

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THE EFFECT OF TEMPERATURE AND HUMIDITY ON HEARING ACUITY

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Speech

by
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M.A., Louisiana State University, 1937
June, 1954

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ACKNOWLEDGMENTS

The author is especially grateful to Dr. C. M. Wise and Dr. Giles W. Gray for their encouragement in undertaking an investigation in an area which was almost totally unexplored. Dr. Gray's patience and attention to details deserve an additional word of thanks.

The study was made possible through the generosity of the Department of Mechanical Engineering of Michigan State College, in providing the necessary test room and the mechanical equipment. The author wishes to thank, particularly, Professor Donald Renwick and his graduate students for the long hours spent in designing and constructing the test room, and in installing and maintaining the equipment.

To the fourteen students who gave many hours of their time, she wishes to acknowledge her gratitude. Their enthusiasm and cooperation were a source of constant inspiration.

To the numerous individuals, organizations, and firms who contributed to the success of the study, the writer wishes to add a word of appreciation:

To Dr. Wilson Paul, Chairman of the Department of Speech, Michigan State College, for the use of audiometric equipment;

To Dr. Oliver McGillicuddy, Lansing, Michigan, for making the oto-rhinolaryngeal examinations;

To Dr. Charles Holland, Olin Memorial Hospital, Michigan State College, for making the physical examinations;

To Dr. Beatrice Fessenden of the Counseling Center, Michigan State College, for assistance on the psychological examinations;

To Mr. Robert Linton, Registrar at Michigan State College, for assistance in compiling the scholastic averages of the subjects;

To the Department of Public Relations, Michigan State College, for photographs of the test room under construction;

To Mr. Roy Underwood, Chairman of the Department of Music, Michigan State College, Major Wade Wilkes, United States Army Medical Corps, and Dr. Paul de Kruif, Holland, Michigan, for valuable suggestions during the planning stage;

To the Sonotone Corporation, Elmsford, New York, for additional audiometric equipment;

To Alpha Chi Omega for a generous stipend which enabled the author to undertake the study;

To Mrs. Earl L. Bradsher for her many kindnesses in preparing the final copy of the dissertation;

And finally -- to the author's family for material assistance in the preparation of photographs and charts, but more especially for their patience and inspiration.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF AUDIOGRAMS

LIST OF QUESTIONNAIRES

LIST OF PHOTOGRAPHS

ABSTRACT

The effects of weather conditions on the human organism have been of interest to man since the days of Hippocrates and Aristotle, but meteoro-biology was not recognized as a valid field of investigation until recent years. Inquiry into the literature revealed a wealth of interesting material on folklore and superstitions. Studies were found dealing with a comparison of crime waves and heat waves, with water retention in dogs and rats under low barometric pressure, and with the relationship of intelligence to the season of the year in which the individual was conceived; but only one study dealt specifically with the effects of temperature on hearing acuity.

The purpose of this study was to determine quantitatively the effect of selected temperature and humidity combinations on the hearing acuity of fourteen male students. Seven of the fourteen had normal hearing, and seven had hearing losses of at least 35 decibels.

The subjects were exposed to seven combinations of temperature and humidity in a test room with controlled atmosphere. The combinations used were as follows:

Temperature	Relative Humidity
70°F.	50%
70°F.	65%
90°F.	65%
90°F.	80%
50°F.	70%
20°F.	80%
70°F.	50%

Audiometric measurements were made for each subject individually on a pure tone audiometer after thirty minutes exposure to the atmospheric conditions of the test room. The frequencies tested were 125, 250, 500, 1000, 2000, 4000, and 8000 cps.

Within the limits of the study, the following conclusions were justified:

1. In identical combinations of temperature and relative humidity, the subjects showed (in thirty-seven out of forty-two audiometric measurements) no significant difference in hearing acuity.
2. At the extreme limits of temperature and relative humidity, the subjects showed (in thirty-three out of forty-two audiometric measurements) hearing losses greater than the 5 decibels normally expected on successive tests for the same individual.
3. In general, hearing acuity is highest at a temperature of 50°F. with a relative humidity of 70 per cent (twenty-seven of forty-two measurements).

4. In general, hearing acuity is lowest at a temperature of 20°F. with an accompanying relative humidity of 80 per cent (eighteen of forty-two measurements), or at 90°F. with a relative humidity of 80 per cent.
5. According to Huntington's theory, the best mental work is done at 50°F. with a relative humidity of 70 per cent. Auditory acuity was highest in twenty-seven of forty-two measurements and second highest in eight of forty-two measurements in this combination.
6. According to Huntington's theory, the best physical work is done at 70°F. with a relative humidity range of 50 to 65 per cent. Auditory acuity was highest in eight of forty-two measurements, and second highest in twenty-eight measurements in the combination of 70°F. with a relative humidity of 50 per cent and 70°F. with a relative humidity of 65 per cent.
7. There was no significant difference in hearing acuity (more than 5 decibels) between 50°F. with a relative humidity of 70 per cent on the one hand, and 70°F. with a humidity range of 50-65 per cent on the other.

In sum, the optimum temperature and humidity combination for hearing acuity, according to the results of this

study, is 50°F. with a relative humidity of 70 per cent, and the combination of 70°F. with a humidity range of 50 to 65 per cent next best.

CHAPTER I

INTRODUCTION

A. Background of the Study

Interest in the study developed shortly after the author accepted a college teaching position in Michigan in 1942. A shortage in personnel in most colleges, a result of World War II, made it necessary for members of the teaching staff to assume additional responsibilities. For the duration of the war, the author directed the activities of the speech and hearing clinic, which included the annual hearing survey of all freshmen and transfer students, as well as the administering of routine audiometric tests to upper classmen and adults who were referred to the clinic. Despite the demands of the war, the enrollment of the freshman class was sufficiently large to produce hundreds of audiograms, and these, plus the routine audiograms made in the clinic, gave the author an opportunity to study results, compare the successive tests made for individuals, and to evaluate her audiometric techniques.

When the results of the survey were compiled, the students with hearing losses were called into the clinic for re-checks. While a large percentage of the re-checks

verified the findings on the survey, in a few cases the second test indicated normal hearing. The circumstances under which the original tests were given, i.e., the tensions connected with registration and with other entrance examinations, the inexperience of the students in taking audiometric tests, and the inexperience of the teaching staff in giving the tests, could have been responsible for some of the deviations noted. However, during the school year, deviations greater than the 5 db normally expected,[1] continued to show up on successive tests given to those individuals who reported to the clinic periodically. The calibration of the audiometer, the conditions under which the tests were given, and the testing techniques of the operators were all questioned in an effort to isolate the factors influencing the results of the tests.

The audiometer was returned to the factory for calibration, but the manufacturer reported that the instrument was in perfect condition.

The physical conditions of the test room were approximately the same for all students. The testing program was

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[1]According to Harris's study the chances are two out of three that retests at 512, 1024 and 2048 cps. will be within approximately 4 db of the same score. He concluded that with reasonably low noise levels and with trained operators, audiograms could be made which would be accurate consistently to at least 5 decibels. (J. Donald Harris, "Free Voice and Pure Tone Audiometer for Routine Testing of Auditory Acuity," Archives of Otolaryngology, V. XLIV, 1946, pp. 452-467.)

carried on in a small, relatively quiet room. The heat was controlled automatically by the building equipment. There was no steam radiator in that particular room, and the heat entered through air ducts.

As far as the physiological conditions of the students were concerned, the operator did not note any special influences which could have accounted for the deviations other than the frequency of respiratory infections, and in these cases the tests were postponed until the conditions improved. Through inexperience, the audiometerist may have failed to observe adequately such clues as restlessness, fatigue, worry and inattention when they were not accompanied by overt behavior.

The effects of weather conditions on the human organism were not recognized as a possible factor affecting hearing acuity until a student in a speech correction class reported that his brother had noted a change in his hearing after spending several months in the Southwest. The brother observed a decrease in catarrh and an increase in hearing acuity. No significance was attached to the report at first, for nowhere in the text books on speech correction and audiology had mention been found of the influence of weather conditions on hearing acuity, and in college courses taken by the author the possibility of such a relationship had never been suggested; but later other reports of fluctuations in hearing abilities came to the attention of the writer, and

conversations with teachers of the deaf and with hard-of-hearing adults seemed to indicate that a number of deafened individuals had observed "good hearing days" and "bad hearing days" depending upon the weather conditions.

One teacher of the deaf recalled an incident involving a student who delivered papers in the late afternoons. When he returned from his work on winter evenings, he seemed to have "a fresh case of sniffles." The occurrence was so regular that the school authorities advised him to discontinue the paper route.

The author herself had an opportunity to observe a member of her family who had a hearing loss. There seemed to be an increase in fatigue, nervousness and irritability during periods of high relative humidity and low barometric pressure. At those times the hard-of-hearing individual was less able to follow conversations, but whether there was an actual decrease in hearing acuity was not determined, since no audiometer was available in the home.

In the course of time, the reports were so numerous and observations so frequent that the question of the weather's effect on hearing was raised with otologists. Dr. Oliver McGillicuddy[2] of Lansing, Michigan, was asked his opinion concerning the possibility of a relationship between

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[2]Oliver McGillicuddy, M.D., personal interview, May, 1950.

weather conditions and auditory acuity. He felt that a relationship did exist and he told of experiences with his patients in which exposure to moist, cold air produced immediate nasal congestions. The recording of weather conditions on the patient's audiogram was routine procedure in his office.

Dr. Andrew Paul Campbell of Chicago stated that "most clinicians feel that temperature and humidity, and weather changes affect hearing, but that to date the exact mechanism has not been discovered."[3] Dr. Edmund Fowler[4] of New York indicated that he believed changes in hearing with weather were based largely on changes in congestion of the respiratory system, and that he contemplated research in that area. Betty C. Wright[5] quoted the late Samuel J. Kopetzky,[6] who was asked to express his opinion concerning the effects of climate on catarrhal deafness.

Dr. Kopetzky was asked the following question:

> "Can you give me an opinion as to the effect of climate on catarrhal deafness; whether the undoubted difference of the individual's condition in different altitudes has any permanent effect on the catarrhal condition in general, and whether it may affect the consequent degree

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[3]Andrew Paul Campbell, M.D., private practice in Chicago, Illinois. Personal letter, May 23, 1950.

[4]Edmund Fowler, M.D., Columbia University, College of Physicians and Surgeons, New York City, New York. Personal letter, May 19, 1950.

[5]Betty C. Wright, Director of Field Services, American Hearing Society. Personal letter, December 5, 1951.

[6]Samuel J. Kopetzky, M.D., formerly associated with New York Polyclinic Medical School and Hospital.

> of deafness? I have had catarrh practically all my life and began to be deaf from that cause at the age of eleven. I am now practically totally deaf. I spent a year in New Mexico where I had almost no catarrhal headaches and I think my hearing was better too. On the other hand here in Washington, the catarrhal symptoms got worse. It would seem that this change might easily have a permanent effect on a person in the incipient stages of catarrhal deafness. In other words, would a case taken early enough improve by removal to a climate less likely to aggravate the symptoms?"

He replied:

> "This is a very sound observation. If the deafness is really caused by catarrhal elements, anything that improves the catarrh will, in the early stages, tend to arrest the deafness. A warm, dry climate is better for people with a catarrhal condition than a damp climate. Once the deafness has become chronic and is advanced, then a favorable climate will probably make the patient more comfortable but is not likely to cause the hearing to be regained. All of the foregoing rests on the assumption that the deafness is catarrhal in nature. This must be determined by a competent specialist. The patient cannot decide it by himself from his symptoms."

The opinions of these otologists stimulated inquiry into the literature in the field of meteoro-biology. A wealth of interesting material was found dealing with folklore, superstitions, weather forecasting by individuals with arthritis and bunions, with a comparison of crime waves and heat waves in New York City, with the relationship of intelligence to the season of the year in which the person was conceived, with seasonal changes in bodily weight, and with water retention in rats due to low barometric pressure. All of this material, together with the reports of students, teachers and deafened adults, the opinions of otologists, and the observations of the author, suggested a more exhaustive study into the possible relationship of weather changes and the behavior of

the human organism, with particular reference to the functions of the auditory mechanism as an aspect of behavior.

B. Review of Literature

Hippocrates, the great physician of the fifth century B.C., warned his young disciples not to ignore meteorology if they wished to achieve the greatest triumphs in the practice of their arts. He believed that meteorology as a science was allied to medicine and in his writings he gave advice to the physician who moved to a new location to set up a practice.

> "Whoever wishes to pursue properly the science of medicine must proceed thus: First, he ought to consider what effects each season of the year can produce; for the seasons are not at all alike, but differ widely both in themselves and at their changes. The next point is the hot winds and the cold, especially those that are universal, but also those that are peculiar to each particular region. . . . For knowing the changes of the seasons, and the risings and settings of the stars, he will have full knowledge of each particular case, will succeed best in securing health, and will achieve the greatest triumphs in the practice of his art. If it be thought that all this belongs to meteorology, he will find out, on second thoughts, that the contribution of astronomy to medicine is not a very small one but a very great one indeed. For with the seasons, men's diseases, like their digestive organs, suffer change."[7]

Aristotle[8] devoted a whole book to weather when he wrote his Meteorologica in the fourth century B.C. He believed that

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[7]Hippocrates, On Air, Water and Places, Tr. by Arthur J. Brock, Greek Medicine (London: J. M. Dent & Sons, Ltd., 1929), p. 53.

[8]Aristotle, Meteorologica, Tr. by H. D. P. Lee (Cambridge: Harvard University Press, 1952), The Loeb Classical Library. See especially the Introduction.

the climate of a nation affected the character of the people and he hoped to convince his compatriots that the weather and its effects on men did not emanate from Zeus or any other diety.[9]

Shaw[10] points out that Meteorologica, a standard text-book in physical sciences for the scholastics of the Middle Ages and the Renaissance, included all the phenomena which are observed in earth, air and sky. Since Aristotle's time the various branches of the study of nature have become separate sciences.

The only other "weather man" mentioned by Shaw between Aristotle and the invention of the thermometer by Galileo and the barometer by Torricelli in the 17th century, was Pliny the elder, who sacrificed his life to his curiosity in the eruption of Vesuvius in 70 A.D. Pliny recorded a great deal of knowledge of air, waters and places.

One of the earliest American followers of Hippocrates was a young Scotch doctor, John Lining, who arrived in South Carolina in 1730. He noted that yellow fever epidemics were seasonal in nature, and so he began to observe and record all sorts of information concerning bodily changes under varying conditions. While he did not discover the cause of

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[9]Jacqueline Berke and Vivian Wilson, Watch Out for the Weather (New York: The Viking Press, 1951), p. 161.

[10]Napier Shaw, The Drama of Weather (London: Cambridge University Press, 1933), p. 44.

yellow fever, he did make one contribution to future scientific studies. Using himself as a subject, and working with instruments of his own construction, he came to the conclusion that bodily weight fluctuated with the weather.[11] This observation was substantiated some two hundred years later by Smith,[12] in his experiments with dogs and rats in a pressure chamber to determine the amount of water retention under low barometric pressures. His conslusions show that there is an increase of body weight due to water retention when the barometric pressure is lowered as much as from 2.6 to 9.8 cm. of mercury during a period of 12 to 48 hours. He also points out that the disturbance of water balance is accompanied by restlessness, and it is his opinion that this hydration could possibly be the mechanism which induced reactions on the part of animals and human beings when there is an approaching weather change.

The work of Ramsey was of particular interest in this study. In 1809 he wrote a history of South Carolina in which he described the medical background of the state. As a follower of Lining he emphasized the importance of weather conditions in his medical practice, and he pointed out that "storminess caused respiratory disorders."[13]

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[11]Berke and Wilson, p. 170.

[12]C. S. Smith, "Water Retention under Low Barometric Pressure," American Journal of Physiology, LXXXVII (1929), 200-207.

[13]Berke and Wilson, p. 173.

The work of Dexter[14] and of Petersen[15] was noted among the 20th century writers who were interested in the effects of weather on individuals. Dexter, a professor of education and psychology at the University of Illinois, was interested in behavior problems among school children. In his effort to answer the questions of his students as to why children were more full of mischief on certain days, he became involved in a comparative study of behavior and weather which is considered "one of the finest and most reliable studies ever made."[16]

Dexter found, for example, that cases of assault and battery in New York City were greater when the temperature was between 80° and 85° F. When the temperature passed 85° and remained at 90° or above, people were too uncomfortable and exhausted to fight. His work was not limited to crime, however, for he devoted a whole chapter to weather influences on children. He observed that they misbehaved on muggy, hot and windy days and that they were best when the weather was cold, calm and clear. Girls were less affected by weather conditions than were boys. In his concluding remarks, which were addressed to school teachers, he reminded them that

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[14]Edwin Grant Dexter, Weather Influences (New York: The Macmillan Company, 1904).

[15]William F. Petersen, Man, Weather, Sun (Springfield, Illinois: Charles C. Thomas, Publisher, 1947).

[16]Berke and Wilson, p. 177.

relative humidity about 60 to 65 per cent.

In commenting upon physiological reactions, Van Cleef says, "If the barometer reads below thirty inches and the hydrometer shows a relative humidity of over 70 per cent, with an air temperature between 75° and 90° F. then the blood circulation is likely to be sluggish, and that frequently induces restlessness and a generally out-of-sorts feeling. . . ."[31]

All of the literature reviewed thus far points to a relationship between weather conditions and the behavior of organisms. With the exception of Jankoff's study on the effects of abrupt and repeated changes in temperature and humidity on the structural changes of the inner ear, no research was found dealing with the relationship between weather conditions and hearing acuity. Additional observations and experimentation were indicated to substantiate the opinions of otologists and clinicians who felt that temperature, humidity and weather changes affected hearing.

In order to make a preliminary study, the author was given access to the records of the test scores of students taking the Seashore Musical Talent Test. Under her direction Brink[32] compared these scores with the temperature and

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[31] Ibid., p. 235.

[32] Donald Brink, A Comparison of Temperature and Relative Humidity with the Seashore Musical Talent Scores at Michigan State College from September 1928 to June 1951. (Unpublished manuscript, Michigan State College, 1951).

> observed in the laboratory. . . . Astute editors of American medical journals promptly rejected every contribution dealing with weather. . . .
>
> The studies were greatly handicapped by the complete lack of support on the part of the authorities of the university with which I was connected. The simplest of equipment and apparatus was denied. These conditions, beyond my control, forced me to proceed without such aid.[17]

After leaving the university with which he was connected, Petersen joined the staff of St. Luke's Hospital in Chicago. Here he was able to observe both patients and normal individuals. His detailed records show that the human body is in a constant state of flux, but he did note one consistent pattern: when one patient was low in blood sugar, so were all the others; when the hydrogen-ion content of the blood was high in one individual, it was high in them all. He gave his observations in a summary taken from The Patient and the Weather.

> As will be shown in detail in the later volumes, each passing atmospheric alteration is associated with changes in all the physiological processes of the body, because each change in the air mass requires prompt autonomic adaptation. The blood and tissue chemistry, the endocrine status, the nervous system, the leukocyte count, the urine, the oxidation-reduction balance, all mirror the gaseous environment. The "polar front" most often involves vascular contraction -- with either general or local spasm -- and in turn the spasm or impairment of the size of the vascular bed involves a relative anoxemia. But this is associated with the entrance into the blood stream of metabolic products produced under conditions of impaired tissue respiration. These intermediary tissue metabolites are generally acid in character, and these in turn stimulate, i.e., dilate capillaries and arterioles and the tissue cells in general. Periods of

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[17]Petersen, Man, Weather, Sun, pp. ix-x.

> relative alkalosis are followed by periods of relative acidosis; of high CO_2 content by periods of low CO_2 content; of low cholesterol by high cholesterol; of low leukocyte count by periods of leukocytosis.
>
> As a result, practically every passing atmospheric disturbance involves a period of stimulation for the individual -- if infrequent, the individual may become lax; if sufficiently frequent and severe, stimulation may be optimal; if too frequent or too severe, the individual becomes over-stimulated, fatigued; the inadequate individual may succumb.
>
> The effect on the human may vary; in one the reaction time may somewhat delay, in another accelerate the effects. Occasionally too, individuals may react in contrary fashion as far as some of the physiological mechanisms are involved, but on the whole the entire population swings in a chemical and physiological rhythm that is identical.[18]

Petersen believed, according to Berke and Wilson, that behind the immediate cause of the failure of an organ to function properly lay some additional factors to be considered in determining why the organ had not been able to resist effectively the disease of infection. He felt that one of the more important factors was that of weather. He is quoted as saying, "The atmospheric environment has been disregarded by physicians for almost a century. We have given the subject lip service -- but only that. We accept the rheumatic weather prophet as a queer phenomenon, forgetting that if weather affects any one individual, it will affect all people and all diseases."[19]

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[18]William F. Petersen, The Patient and the Weather (Ann Arbor: Edwards Brothers, 1936), II, 28-29.

[19]Berke and Wilson, p. 1. The Patient and the Weather

Jankoff[20] in his study on the effect of temperature changes on hearing seems to agree with Petersen's statement that there is some additional factor behind the immediate cause of failure of the body to function properly, for he proposed to show that the effect of repeated abrupt changes in temperature brought about permanent damage to the inner ear. He disagreed with Temkin[21] who felt that if temperature had any effect on occupational deafness, the damage was to be found in the middle ear. The greater portion of Jankoff's report dealt with laboratory findings of the mechanisms of the inner ears of guinea pigs which had been subjected to the same environmental conditions as those experienced by the persons whom he examined and tested.

In his investigations he used as subjects 310 railroad engineers and cabmen who were given repeated hearing tests over a period of four years. Individuals with hearing losses from disease and infections were not considered in the experiment and careful records were kept of the physical conditions of the men. The hearing tests used were those of

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[20]Georg Jankoff, "Die Wirkung von Temperaturschwankungen auf das Gehör," Monatsschrift für Ohrenheilkunde und Laryngo-Rhinologie, (Berlin und Wien: Verlag Urban & Schwarzenberg, 1940. 74. Jahrgang), 219-41.

[21]J. Temkin, "Wirkung von Temperaturschwankungen der professionellen Schwerhörigheit," Monatsschrift für Ohrenheilkunde und Laryngo-Rhinologie, (Berlin und Wien: Verlag Urban & Schwarzenberg, 1933. 67. Jahrgang).

Renne[22] and Weber[23] since he wanted to know whether the loss was in the middle ear or the inner ear and whether the loss was bilateral or unilateral. His results indicated that among the engineers the loss was consistently greater in the right or exposed ear, while the loss among the cabmen, who were not exposed to abrupt changes in temperature, showed no consistency as to the deafened ear. The loss shown by the engineers was progressive, and it covered the whole range of audible frequencies.

In making his observations, Jankoff placed a thermometer inside the cab of the engine and a second thermometer outside the cab. Variations between the two instruments ranged from 18° to 44°, with 21.2°F. the lowest outside temperature recorded and 113°F. the highest inside temperature. He pointed out that the temperatures were considerably lower during certain times of the year, but that circumstances had not permitted him to observe the instruments under conditions other than those listed in his research. He was able to make several trips, however, and he found that the engineer put his head outside the cab 50 times in an hour and a half.

Jankoff believed that the abrupt changes experienced by the engineer, the repeated heating and chilling of the

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[22]A test to compare a patient's ability to hear by air conduction and by bone conduction.

[23]A test to determine whether the deafness is bilateral or unilateral.

right side of the head, produced dilatations and contractions of the blood vessels which resulted in anoxemia (oxygen deficiency), hyperoxemia, arteriovenus anastomosis (union of an artery and a vein to form intercommunication),[24] edema of the membranes, and hemorrhages of the small blood vessels of the inner ear. He contended further, that since the ear was a "weak" organ, incapable of recovery from the conditions he described, a permanent deafness resulted which was progressive in nature.

Jankoff then refuted the arguments of his colleagues who believed that noise is an important factor in occupational deafness among railroad engineers, by pointing out that had the loss been caused by noise and percussion, the deafness would have been immediate and not progressive, that it would have been in the middle ear and not in the inner, and that it would not have been limited to the exposed ear.

In his experiments with guinea pigs, Jankoff subjected the animals to the same abrupt temperature changes as those experienced by the engineers. Examination of the dissected mechanism of the inner ear revealed a condition similar to

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[24] In a review of the literature of Folkow and Ström, Grant discusses the physiological effects of heat and cold on cats, in which arteriovenus anastomoses were involved. Dilatation was more pronounced in the fore limbs than in the hind and there was little change in arterial pressure. Small changes were demonstrated in the ear vessels, but none in the intestinal veins. (Ronald Grant, "The Physiological Effect of Heat and Cold," Annual Review of Physiology, V. XIII, 1951, pp. 75-94.)

that which he described for the human ear. He concluded his report with a discussion of contemplated research in which more refined methods of examination of the inner ear of the guinea pig would be employed. He also felt that all the nations of the world should cooperate in further study of the effects of meteorological environment on the human being.

Hartmann[25] experimented with students of normal hearing at Pennsylvania State College to determine the degree of visual acuity under varying degrees of illumination. The abstract of his work contained a list of previous research in the field of visual acuity through simultaneous stimulation of other senses. In 1776 Johann Ebermaier and Ernst Horn of the University of Göttingen reported on the beneficial influence of light rays into the auditory canal following a loss of hearing from a disease. This latter study was of interest because it provoked the question as to whether the warmth from the light rays had improved the hearing or the light rays *per se*.

Edwards,[26] in surveying the needs of the hard-of-hearing school child in Indiana, made no attempt to classify the pupils into areas according to weather conditions, but

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[25]George W. Hartmann, "Changes in Visual Acuity Through Simultaneous Stimulation of Other Senses," *Journal of Experimental Psychology*, XVI (1933) 393-407.

[26]Elsie M. Edwards, *Educational Needs of Hard-of-Hearing Children in the Public Schools of Indiana* (Unpublished Master's Thesis, Indiana State Teachers College, June, 1945). Personal interview, May, 1950.

she noted that the percentage of hearing losses per school population in the "smog" areas of Indiana was greater than those in the "non-smog" areas.

Berke and Wilson (p. 9) believe that someday science will be able to measure all the complex effects of weather just as it already is measuring the effects of heredity, diet, and cultural environment. Only recently has medical meteorology or meteoro-biology been recognized as a valid field for investigation. The works of Mills[27] and Huntington[28] are contributions to this infant science.

In his Introduction to Seasons of Birth, Huntington reviews the findings of his earlier studies, Civilization and Climate, which seem to indicate that there are two definite climatic optima, or two sets of the most favorable weather conditions. One optimum is physical with an average temperature of 60° to 65° F. The other is mental, and he estimates it at 39° to 54° F. While humidity, variability of temperature, and other conditions such as sunlight play a part in the reaction of the human organism to the optima, temperature

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[27]Clarence A. Mills, Climate Makes the Man (New York: Harper & Brothers, 1942).

_____, Medical Climatology (Springfield, Illinois: Charles C. Thomas, 1939).

[28]Ellsworth Huntington, Seasons of Birth; Its Relation to Human Birth (New York: John Wiley and Sons, 1938).

_____, Civilization and Climate (New Haven: Yale University Press, 1915).

is the dominant factor.

Huntington explains the two optima in this way. With regard to the physical optimum, our bodies function best at the temperature which prevailed in primitive times during the mating season, for children conceived at that season were best able to survive. With regard to the mental optimum, our minds function best at the temperature which prevailed in primitive times at the normal season of birth.

The research of the American Society of Heating and Ventilating Engineers[29] mentions an "ideal" combination of temperature and relative humidity for most individuals. While the comfort zone differs somewhat according to age, sex, occupation, and season of the year, the average, according to their findings, is between 65° and 72° F. with relative humidity between 45 and 50 per cent.

Van Cleef[30] discusses the effect of temperature and humidity upon people engaged in manual tasks. He points out that days of high temperature combined with high humidity are debilitating, while those with moderate temperature and low humidity are somewhat irritating. He agrees with Huntington when the latter says that the best physical work is done when the temperature is in the neighborhood of 65° to 70° F. and

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[29] Heating, Ventilating, Air Conditioning Guide (Baltimore: Horn-Shafer Company, 1944), pp. 41-70.

[30] Eugene Van Cleef, The Story of the Weather (New York: The Century Company, 1929), pp. 242-243.

relative humidity about 60 to 65 per cent.

In commenting upon physiological reactions, Van Cleef says, "If the barometer reads below thirty inches and the hydrometer shows a relative humidity of over 70 per cent, with an air temperature between 75° and 90° F. then the blood circulation is likely to be sluggish, and that frequently induces restlessness and a generally out-of-sorts feeling. . . ."[31]

All of the literature reviewed thus far points to a relationship between weather conditions and the behavior of organisms. With the exception of Jankoff's study on the effects of abrupt and repeated changes in temperature and humidity on the structural changes of the inner ear, no research was found dealing with the relationship between weather conditions and hearing acuity. Additional observations and experimentation were indicated to substantiate the opinions of otologists and clinicians who felt that temperature, humidity and weather changes affected hearing.

In order to make a preliminary study, the author was given access to the records of the test scores of students taking the Seashore Musical Talent Test. Under her direction Brink[32] compared these scores with the temperature and

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[31] Ibid., p. 235.

[32] Donald Brink, A Comparison of Temperature and Relative Humidity with the Seashore Musical Talent Scores at Michigan State College from September 1928 to June 1951. (Unpublished manuscript, Michigan State College, 1951).

humidity readings for the day and hour on which the tests were given to see if a trend or pattern of reactions could be discovered which would serve as a guide in determining the combinations of temperature and humidity to be used. The basic findings indicated a tendency for performance in pitch and intensity discrimination to be higher when the relative humidity was below the 80% level and a tendency for the performance scores to drop when there was a sharp increase in humidity. Since the test scores were not obtained under carefully controlled atmospheric conditions, the tests having been given in a classroom, the results indicated only a presence, but not a degree of relationship.

Although it was recognized that other factors may have influenced the scores of the Musical Talent Test, the basic findings were the motivation needed to carry on the study.

C. Purpose of the Study

The purpose of this study, then, was to determine quantitatively the effect of temperature and humidity on hearing acuity. No effort was made to determine why the hearing was affected nor how it was affected. The study proposed to measure the hearing loss or gain in decibels when both hard-of-hearing and normal hearing individuals were subjected to selected combinations of temperature and humidity. The study was not designed to evaluate the "social adequacy" of the hearing of the subjects.

The research presented here should be considered only a preliminary study, designed to discover trends in a possible relationship between weather conditions and hearing acuity.

CHAPTER II

PROCEDURE

A. Physical Plant

A controlled atmosphere test room, designed to maintain independently an ambient temperature range of 20° to 95° F., and a relative humidity from 40 to 95 per cent, was constructed by the School of Engineering at Michigan State College.[33] The operation and maintenance of the heating, cooling and humidifying equipment were under the direct supervision of Professor Renwick and a group of graduate students in mechanical engineering.

The basic structure of the room, a portable cold storage unit purchased as war surplus material, was set up in the southwest corner of the basement of the Engineering building with a wide passage between it and the outer wall. This position afforded relative freedom from the noise of

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[33] Loren G. Miller, Dean of the School of Engineering, member of American Society of Heating and Ventilating Engineers, and American Society for Engineering Education.
Leonard C. Price, Chairman of the Department of Mechanical Engineering, member of the American Society of Mechanical Engineers, and American Society for Engineering Education.
Donald J. Renwick, member of American Society of Refrigerating Engineers, American Service Engineers' Society, and American Society for Engineering Education.

street traffic and of passing students. The structure was enlarged and modified to meet the requirements in the design of the test room with respect to the temperature and humidity control. Additional insulation between the walls, and sound treating of the inside walls, ceiling and floor were necessary not only to obtain a quiet room[34] with less than 24 decibels of noise, but also to provide a room in which the temperature and relative humidity would remain constant during the testing period. Fibreglass insulation was used between the outer and inner walls to a total thickness of six inches, and the inside walls and ceiling were treated with acoustical insulation boards. Velvet drapes and the carpeting used in the furnishing of the room assisted in the reduction of noise.

Other modifications included the addition of a vestibule, something like a sound lock, around the one entrance to the test room, and the installing of a double glass window in the outside wall. (See Photograph I.) The vestibule

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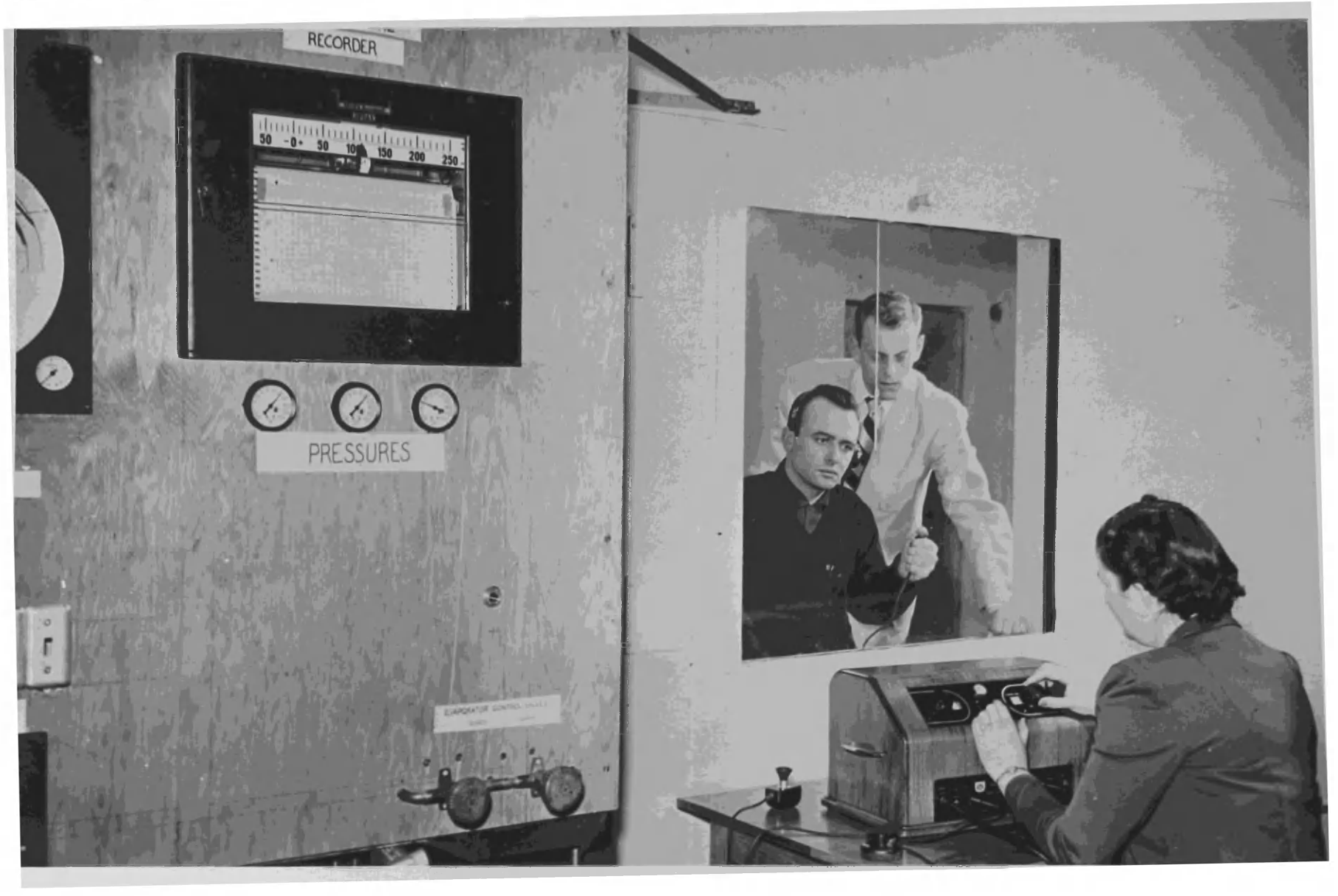
[34]Tolan and Watson define a quiet room as one in which the noise "level" does not exceed 35 decibels. They report that the testing rooms of otologists who were surveyed in a study to determine the effects of office noise on audiometry, had an average noise level of less than 24 decibels, and that the soundproofed booths of the U.S. Public Survey averaged 25 to 42 decibels. The results of the Public Health Survey Hearing Studies conducted in those booths were used in the determination of normal hearing and in the founding of the absolute calibration of all audiometers. (Leland A. Watson and Thomas Tolan, Hearing Tests and Hearing Instruments. Baltimore: The Williams and Wilkins Company, 1949, p. 25.)

PHOTOGRAPH I

Installation and Testing of Audiometric Equipment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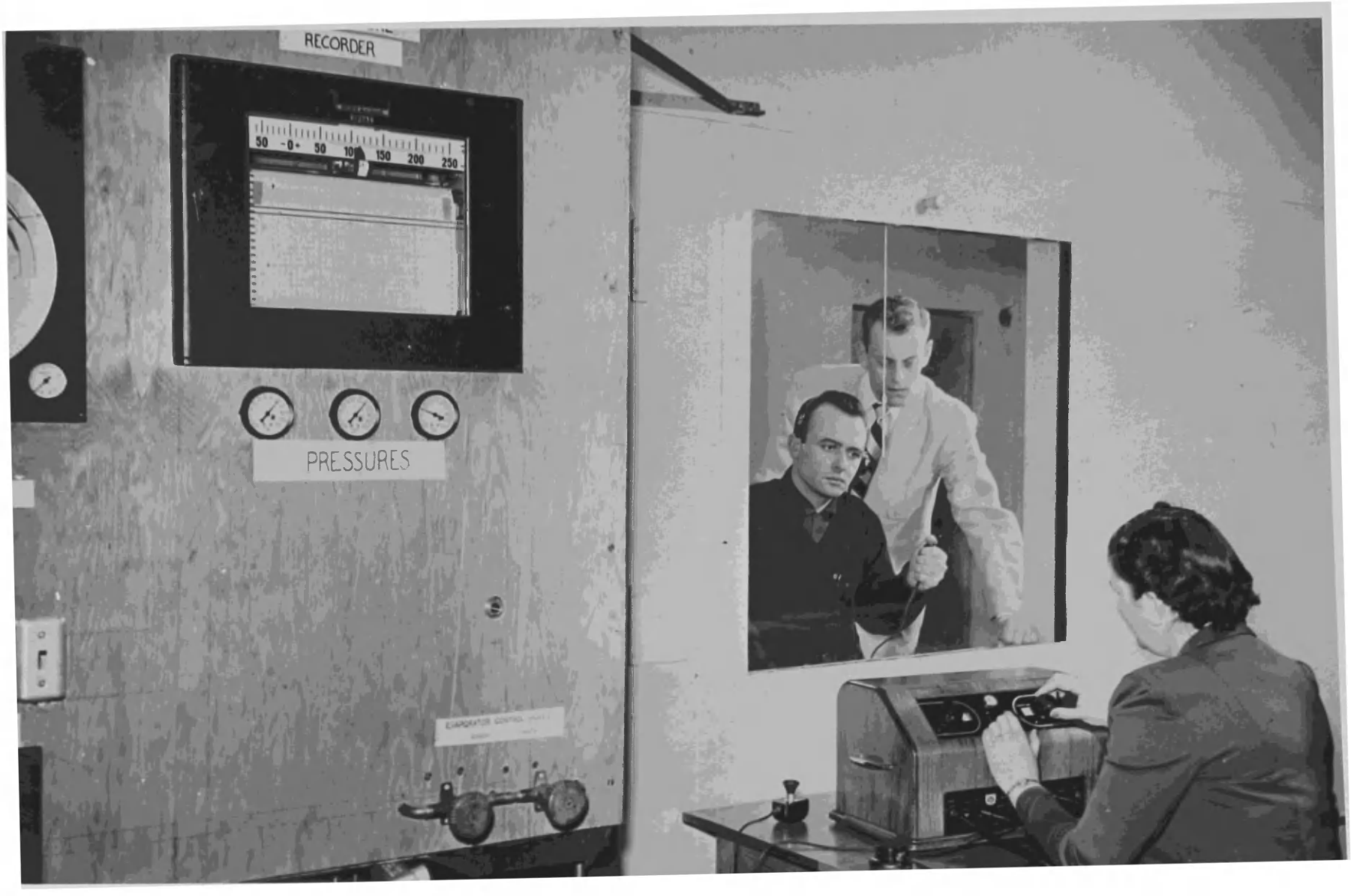
PRESSURES

PHOTOGRAPH I

Installation and Testing of Audiometric Equipment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50 -0+ 50 100 150 200 250
PRESSURES

d as a protection against changes in atmospheric conf the room when the six-inch-thick insulated door was opened. The window served two purposes: (1) to allow the operator in the passageway to observe the subjects in the test room, and (2) to eliminate somewhat the feeling of being closed in. The window of the unit was directly opposite a basement window of the building itself, affording a view of the campus; it also permitted additional light to enter the room.

The outside dimensions of the room were 17' x 9' x 10' and the inside dimensions were 12' x 8' x 7½'. The size of the room added to the physiological comfort of the occupants, for it was large enough to relieve the feeling of being closed in previously mentioned. A soft shade of paint on the walls, together with the carpeting, chairs, a table and magazines improved the physical surroundings and were conducive to relaxation.

A second room, adjacent to and directly behind the test room, was built to house the mechanical equipment, which included one 5 HP Frick refrigeration unit with Minneapolis-Honeywell dampers and controls, McQuay heating and cooling coils and humidifying apparatus. A Brown electronic multipoint temperature recorder and miscellaneous instruments and controls were used to maintain combinations of temperature and relative humidity selected for each test. (See Photograph II.) Instruments inside the test room were

PHOTOGRAPH II

Test Room under Construction

Showing Various Instruments and Controls

a thermometer and a barometer. The latter was set at 874 feet above mean sea level according to measurements of the United States Weather Bureau at Lansing, Michigan.

At no time during the experiment was it necessary for the investigator to assume responsibility for the maintenance of the mechanical equipment and its operation. After the proposed study was outlined to the Dean of Engineering, experts in the area of sound treating, heating and refrigeration were assigned to the construction, operation and maintenance of the equipment in accordance with the needs of the study. One or more engineers were present at each testing period.

The investigator was responsible, however, for all equipment used in and related to the audiometric tests.

The audiometric equipment consisted of Model AE 21 Sonotone Pure Tone Clinical Audiometer,[35] two dynamic air conduction receivers matched as to frequency response and output, one reaction type bone conduction receiver, a double headband, a microphone, and a signal cord and lamp. The audiometer had a built-in masking device and a tone interrupter. A control unit was available, but it was not used in this study.

The audiometer was placed outside the test room with all the cables to the various receivers and signaling devices

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[35]Accepted by the American Medical Association and The American Standards Association in February, 1949.

sealed into the walls and projecting into the test room. Since exposure to excessively high temperature and humidity softened the plastic diaphrams of the receivers and altered the output,[36] a plan was worked out by which the receivers could be removed from the room between tests and dried in a desiccator jar charged with anhydrous calcium chloride. By using longer cables and additional plugs and receptacles duplicating those on the audiometer, a second instrument panel was constructed on the inside wall of the test room. The cables from the audiometer terminated in the receptacles of the panel, and the plugs on the receivers and signaling devices were inserted into the inner panel, thus permitting frequent removal of the receivers without disturbing the cables sealed into the walls.

The audiometer generated pure tones from 125 to 12,000 cycles per second. The frequency dial was calibrated in two scales: (1) according to the traditional tuning fork octave scale of 128, 256, 512, 1024, 2048, 4096 and 8192 and (2) in multiples and submultiples of 1000 cycles, i.e. 125, 250, 500, 1000, 2000, 3000, 4000, 5000, etc., and intermediate points. The latter scale, accepted by the American Standards Association's Committee on Acoustical Terminology in 1946,[37]

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[36]According to data obtained from the Sonotone Corporation, exposure of one half hour in a temperature of 90° F. and relative humidity of 95 per cent produced a change of less than 1 db. at all frequencies from 125 to 8000 cps.

[37]Watson and Tolan, p. 23.

was used in this study; and the frequencies tested in this study were 125, 250, 500, 1000, 2000, 4000, and 8000. The sensation level of those tones was determined by the setting of the hearing loss dial. The amount of energy required to provide a sensation of increased loudness varies somewhat at different frequency and intensity levels,[38] but the audiometer made the necessary adjustments automatically through a cam system which linked the frequency dial with the hearing loss dial.

The masking dial which controlled the built-in masking device was marked in numerals from one to ten and not in decibels. Carter explained the use of numbers as follows:

> At the time this audiometer was designed, there was no generally accepted procedure for calibrating the intensity of a masking tone which contains a wide variety of frequencies. Nor was there a recognized procedure for applying a masking tone when making a hearing test. For these reasons we made no effort accurately to calibrate the intensity of the masking tone on our audiometer. The numbers on the dial are merely for the purpose of convenience in repeated settings on successive tests.[39]

The distance between the operator and the subjects necessitated the use of the signal light instead of the hand signal or affirmative and negative nods preferred by some audiometerists. Watson[40] points out that if the subjects are

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[38] Ibid., p. 5.

[39] E. P. Carter, Sonotone Corporation, Audiometer Department. Personal communication, March 2, 1954.

[40] L. A. Watson, A Manual for Advanced Audiometry (Minneapolis: The Maico Company, Inc., 1949), p. 10.

intelligent and if they have good coordination, the signal light makes it possible to conduct tests in a shorter period of time. The microphone was used solely for communication from the operator to the subjects and not as a part of the test equipment.

Miscellaneous test equipment included clinical fever thermometers, a stop watch, audiogram blanks and colored pencils.

B. Temperature and Humidity Combinations

The studies of Huntington, Van Cleef, and the American Society of Heating and Ventilating Engineers previously referred to[41] state that the "ideal" combinations of temperature and relative humidity[42] vary with the seasons, with age, sex, occupation and with the health of the individual, but that the average comfort zone for most individuals is from 65° to 72° F. and humidity from 45 to 50 per cent. The summer ideal is from 65° to 72° and humidity close to 70

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[41] See pp. 18-20.

[42] Longstreth defines humidity as the degree to which the air is charged with water vapor. Absolute humidity expresses the weight of water vapor per unit volume of air. Relative humidity is the ratio of the actual vapor pressure to the vapor pressure corresponding to saturation at the prevailing temperature, or simply the percentage of saturation. Specific humidity expresses the mass of water vapor contained in a unit mass of moist air. (T. Morris Longstreth, Understanding the Weather, New York: The Macmillan Company, 1953, p. 112.)

The term humidity as used in this study always refers to relative humidity.

per cent and the winter ideal is from 38° to 40° F. Huntington observes that in spring and fall the best work is performed at 50° F. with humidity about 75 per cent. He distinguishes between mental work and physical work and lists the mental optimum at 38° to 54° F. and the physical optimum at 60° to 65° F. He feels that temperature exerts a greater effect on work output than does humidity. The observations of Brink, on the other hand, seem to indicate that the test scores of students taking the Seashore Musical Talent Test drop when there is a sharp increase in humidity.

While the choice of temperature and humidity combinations for this study was dependent somewhat upon the capacity of the mechanical equipment, the range from 20° to 95° F. and humidity from 40 to 95 per cent was sufficient to permit testing at the average comfort zone of 70° F. and 50 per cent humidity, at the summer ideal of 70° F. and 65 per cent humidity, at the mental optimum of 50° F. and 70 per cent humidity and at combinations where the humidity was above the 80 per cent level, and where the temperature was 40° above and below the mental optimum.

The combinations chosen and the order in which the tests were given are listed below.

Test	Temperature	Humidity
1	70°	50%
2	70°	65%
3	90°	65%
4	90°	80%
5	50°	70%
6	20°	80%
7	70°	50%

C. The Subjects

The subjects used in this study were fourteen male students between the ages of 18 and 28. Seven of the group had normal hearing, and seven had a loss of at least 35 decibels in the frequencies from 125 to 8000 cps. The hearing acuity of the entire group ranged from well above the normal threshold to 70 decibels below the normal threshold in one or more frequencies.

All of the subjects fairly well matched as to general college ability and scholastic standing as indicated on college entrance examinations and grade averages. Physical examinations showed that all were normal, healthy adults, although the examining physician felt that Subject 8 was "a mild spastic." Subject 7 had had poliomyelitis, but there was no evidence of paralysis at the time of the examination. Oto-rhinolaryngeal examinations indicated that six of the seven hard-of-hearing group had obstructive deafness, and one had mixed deafness. Four had losses in the right ear, one in

the left, and two had bilateral losses with the left ear the poorer ear in both cases.

The subjects comprising the normal hearing group were juniors and seniors in speech correction who were familiar with audiometric techniques. The hard-of-hearing group had had numerous experiences in audiometric testing in the speech and hearing clinic and with their own oto-rhinolaryngologists.

Details of the physical examinations, oto-rhinolaryngeal examinations, entrance examinations and scholastic standing are given in Chapter III, Case Studies.

D. Testing Procedure

There were two phases to the testing procedure.

1. To expose individually the fourteen subjects to seven different combinations of temperature and humidity and to observe and record their physiological reactions.

2. To give audiometric tests to each subject after exposure of thirty minutes to the different atmospheric conditions of the test room.

A distinction should be made between a reaction to an immediate change in temperature and humidity, and acclimatization to a change in climate. The latter requires approximately three years, and in some cases the thermal regulating systems of individuals never adjust adequately to a change in climate. Acclimatization is concerned with a change in body chemistry and in the thickness of the

thermal insulating tissues, while day-by-day or seasonal reactions which result in interference with the normal physiologic functions of the body are dependent upon the characteristics of the individual heat regulating system.[43]

Wright[44] described an experiment involving the reactions of individuals to slowly rising temperature. The subjects were placed in a room in which the temperature was increased from 78.8° to 105.8° F. over a period of forty minutes. Under these conditions there was a latent period of thirty minutes before sweating began. According to Wright, sweating is a result of a rise in internal (rectal) temperature (acting centrally) and a rise in skin temperature (acting reflexively). He pointed out, however, that when the rise in external temperature was rapid, the latent period could be shorter. He does not cite experiments relating to changes resulting from corresponding drops in temperature.

The changes from the outside weather conditions to those of the test room were, in most cases, abrupt changes, therefore a thirty minute exposure period was deemed sufficient to determine the reactions of the subjects to the test room environment. A comparison of the outside weather conditions and those of the test room is given on each audiogram. See Chapter III, Case Studies.

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[43] Heating and Ventilating Engineers, pp. 56-58.

[44] Samson Wright, Applied Physiology (Revised Edition; London: Oxford University Press, 1948) pp. 696-697.

The data collected in the two phases of the test procedure, together with information supplied by the subject before and after the test periods, were recorded on questionnaires and on the audiogram blanks. The pulse rate and temperature were checked before the subject entered the room, and again just before he left. He answered questions relative to his feeling of well being, amount of rest, unusual activities which might affect the test results, and degree of comfort in the test room. He recorded bodily changes such as sweating, shivering, time of onset of nasal drip or headache. Instructions were not given as to the type of reaction to look for, but instead, he was asked to describe how he felt in the room. The operator observed the subject during the waiting period and made comments on restlessness, relaxation, changes in skin coloring, sweating and shivering. A stop watch was also used to record the amount of time used by each subject in responding to the audiometric stimuli.

When the waiting period of thirty minutes had elapsed, the subjects removed the audiometer receivers from the desiccator jar, and inserted them into the panel outlets. They had been instructed in the proper procedures and for adjusting the headband and using the bone conduction receiver. After checking the receivers and the operation of the signal light, the subject turned his back to the operator, assumed a comfortable position and indicated his readiness to

begin the test by flashing the signal light. The motors, which had been running during the thirty minute period in order to maintain the desired temperature and humidity level, were turned off by the attending engineer.

The operation of the audiometer was in accordance with instructions from the Sonotone Corporation[45] and the testing techniques followed the practices recommended by Watson and Tolan (pp. 35-47). All hearing tests were begun at 1000 cycles. Witting and Hughson[46] confirmed the value of this practice in a study relating to accuracy in audiometric techniques. Their results show that a smaller percentage of errors was made when tests were begun at 1024 than when they were started at any other frequency.

The frequency dial was set at 1000 cycles and the hearing loss dial was turned up until the subject heard the tone easily. The interrupter switch was then used to cut out the tone while the hearing loss dial was turned to an intensity well below the subject's estimated threshold. The intensity was then increased in steps of 10 decibels, with the interrupter switch cutting out the tone while the intensity dial was being changed. As soon as the subject indicated that the tone was audible, the intensity was decreased to a level of

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[45] Manual of Instructions (Elmsford, New York: Sonotone Corporation, 1947), pp. 7-9.

[46] G. E. Witting and Walter Hughson, "Inherent Accuracy in a Series of Clinical Audiograms," Laryngoscope XX (1940): 295.

5 decibels below the point where the tone had been perceived, and a second attempt was made to determine the threshold. When at least two out of three attempts to locate the threshold showed that the tone had been heard at the same intensity, the hearing loss dial was moved to an intensity below the subject's threshold while the audiogram was marked.

The same procedure was followed in determining the thresholds for 2000, 4000, and 8000 cycles, after which the operator returned to 1000 cycles to re-check that threshold before testing at 500, 250 and 125 cycles. The technique as described was then used in testing the other ear.

Air conduction tests were given to both groups of subjects, but bone conduction tests were given only to the hard-of-hearing subjects. On the former test the deafened group was first tested with masking on the better ear, followed by an evaluation without masking. Masking was used for bone conduction at all times. The proper setting for the masking dial had been previously determined for each subject according to his degree of hearing loss. The numerals 1, 2, and 3 were used to indicate the setting of the dial.

The frequencies explored in bone conduction were 125 through 4000 cycles. The subjects had been instructed in the proper procedure for locating the area on or near the mastoid prominence where the receiver should be placed. The receiver was not attached to a head band, but was held by the subject. The Manual of Instructions (p. 9) pointed out that at all

frequencies above 250 cycles the insulation of the receiver housing prevented transmission of vibrations to the fingers.

When the tests were completed, the receivers were returned to the desiccator jar, the subject completed the questionnaire concerning his comfort in the test room, and his temperature and pulse rate were noted and recorded. Readings were taken of the barometer inside the test room and of the Brown electronic multipoint recorder which had registered rises or falls of temperature during the period when the equipment was not in operation. The engineers then started the motors to prepare the room for the next test.

CHAPTER III

THE DATA

The data are organized in this chapter in the following manner:

A. Explanation of the Types and Purposes of the Various Examinations and Tests Administered to the Participating Subjects, Together with a Description of the Audiograms, Questionnaires and Tables Used in Presenting the Data.

B. Case Studies for Each of the Fourteen Subjects.

1. Details of the physical and oto-rhinolaryngeal examinations.
2. Results of the American Council on Education Psychological Examination and of the Cooperative Reading Test.
3. Scholastic standing of the subjects.
4. Data collected on the experimental audiometric tests and recorded on audiograms, questionnaires and a summary table.

A. Explanation of Types and Purposes of Examinations and Tests. Description of Forms Used in Presenting the Data.

Fourteen male students were given audiometric tests in an atmosphere controlled room in seven combinations of temperature and humidity. Subjects 1 through 7 had normal hearing, while Subjects 8 through 14 had losses ranging from moderate to severe.

1. Physical and oto-rhinolaryngeal examinations.

A physical examination was given to determine the state of health of each subject before he was accepted for participation in the experiment. Results of the laboratory tests were either negative or within normal limits for all subjects.

Oto-rhinolaryngeal examinations were given to determine the condition of the hearing mechanisms of the normal group and the type, degree and cause of deafness among the hard-of-hearing group. In determining the cause of the deafness, the possibility of including an individual with psychological deafness was lessened.

Results of the examination showed that two of the normal hearers had acute rhinitis at the time of the examination and that both were subject to frequent colds during periods of cold, humid weather. Tonsils were present in both, one moderately infected, while the other had small tonsils and an adenoid mass which was not encroaching on the ostia. Subject 3 had a perforated right tympanum and hypertrophic

turbinates, but no history of deafness. Subject 4 had had ear infections in childhood, but none since. Small cryptic tonsils and small adenoid pads were present, but no history of deafness.

Six of the seven subjects with hearing losses were diagnosed as having obstructive deafness, one as mixed. Four had losses in the right ear, one in the left and two had bilateral losses, with the left the poorer ear in both cases. Five had had supperative otitis media, two instances of which were intermittent and one chronic. Subject 10 had had a mastoidectomy at the age of five with resulting low tone deafness. Subject 14, who had been deafened at the age of nine, had no history of infection. Subject 11 was being treated for chronic supperative otitis media and medical attention was advised for Subject 13, who had small septic tonsils. Details of these tests are found in the individual case studies.

2. Psychological examination and cooperative reading test.

A measure of general college ability of the subjects was obtained from the scores of The American Council on Education Psychological Examination and the Cooperative Reading Test, which were administered at the time of college entrance. While these tests may not have any direct bearing on the results of the audiometric tests other than to indicate that

the subjects were normal individuals capable of carrying out instructions relative to the testing procedure, they do give a more complete picture of the subjects who took part in the study.

The results of the Psychological Examination are recorded by means of three scores. The Q. or Quantitative score measures abilities involved in quantitative thinking, and it is probably most significant in measuring abilities in scientific and technical curricula. The L. or Linguistic score measures linguistic abilities and is probably most significant in language, literature and social studies. The T. or Total score is the sum of the Q. and L. scores, and it is a measure of general college abilities. The scores, based on local norms, were ranked in deciles with 10 representing the highest 10% of the norm group.

On the Cooperative Reading Test the V. or Vocabulary score is a measure of general reading (recognition) vocabulary. The R. or Rate of Comprehension score is a composite measure of reading speed and comprehension. The C. or Comprehension score is a measure of the difficulty level at which a student is able to read comprehendingly. The T. or Total score is a measure of general reading ability. This test, based on local norms, was ranked also in deciles with 10 representing the highest 10% of the norm group. Details of these tests are found in the individual case studies.

3. Scholastic standing.

The scholastic standing of the fourteen subjects was obtained from the records of the Office of the Registrar at Michigan State College. The system of using a numerical figure to represent the accumulated grades of the student assigns 1.00 to represent D, 2.00 to C, 3.00 to B, and 4.00 represents an all A average. All fourteen subjects were C students with point averages ranging from 2.00 to 2.81.

4. Data collected on experimental audiometric tests.

The data are recorded on audiograms, questionnaires and tables. The case study of each subject contains eight copies of the audiogram (one made outside the test room and seven in the test room), seven copies of the questionnaire and one copy of a table which gives a summary of the scores made on the seven experimental tests. Subject 12, who took part in two repeat tests, has eleven audiograms and nine questionnaires.

Pertinent information concerning the temperature, relative humidity and barometric pressure inside the test room and the weather conditions outside the test room is designated on the appropriate blanks above the audiogram. The markings used to record the threshold for frequencies tested are those recommended by Watson and Tolan[47] with the

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[47]Watson and Tolan, Hearing Tests and Hearing Instruments, p. 38.

addition of the customary use of red lines for the right ear and blue lines for the left ear. A key to the markings is found below the audiogram.

The data on the questionnaire were compiled from the forms filled out by the subjects before and after the testing periods, and they indicate subjective feelings of well being, degree of comfort in the test room, internal temperature and pulse rate and any unusual event which might affect the result of the tests. Space is provided for comments by the operator.

The case study of each subject with normal hearing contains two Summary Tables, one for the right ear and one for the left ear. The subjects with hearing losses have four Summary Tables, one for the poorer ear with masking, one for the poorer ear without masking, one for bone conduction, and one for the better ear.

The Summary Tables show the results of the seven tests taken by each subject. The tests, numbered 1 through 7, are listed horizontally together with the corresponding temperature and humidity combinations. The first column in each table indicates the seven frequencies tested, the Sigma Loss, Average Loss for all frequencies, and the "Rank." The total loss in decibels for each test is expressed as Sigma Loss, and the Average Loss was determined by dividing the Sigma Loss by the number of frequencies tested, which for this study was seven for air conduction and six for bone conduction.

"Rank" shows the relative position of the test on a scale of one to seven with one representing the minimum decibel loss and seven the maximum decibel loss.

Columns 2 through 7 list the decibel loss for each test at all frequencies and column 8 indicates the deviation[48] from minimum to maximum loss at each frequency and for both the Sigma Loss and the Average Loss.

The use of Average Decibel Loss is not to be confused with the conversion of decibel loss into "percentage of hearing loss," a practice described by Watson and Tolan (p. 48):

> The audiogram shows an individual's "field of hearing," in decibels at the various frequencies. The term "sensation unit" was also used to designate decibels below the normal threshold of hearing. But since neither a decibel nor a sensation unit had any significance to the general public, it has been a practice almost since the development of the audiometer to attempt a conversion of decibel loss into "percentage of loss for speech." The demand for such a conversion into a simple percentage figure has resulted in considerable confusion and error in audiometric studies in schools and elsewhere. Throughout the U. S. for years operators, technicians and even otologists have been adding up the decibel loss of the three frequencies 512, 1024, and 2048, averaging the loss for these frequencies, and multiplying by .8. Not one person in a hundred performing this calculation could give any logical explanation for it or why the resulting figure should represent an individual's percentage of hearing loss. Unfortunately the practice is being widely continued and is even found as standard recommended procedure in the Federal Vocational Rehabilitation Bulletin, Series No. 27, Department of the Interior, 1943.

Watson and Tolan then indicate that ". . . a committee of Consultants on Audiometers and Hearing Aids of the

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[48]In this study the term deviation is used to express a difference between scores.

American Medical Association . . . recommended that all hearing loss be quoted in terms of average decibel loss pending the formulation of some more acceptable basis for rating capacity to hear speech" (p. 49).

This study used Average rather than the Total Decibel Loss.

B. Case Studies for Each of the Fourteen Subjects

Subject 1

1. Medical Findings

   a. Physical Examination

      Age: 22

      Height: 72"

      Weight: 186

      Heart and lungs: Normal

      Chest X-Ray: Negative

      Blood pressure: 120/77

      Abdomen and extremities: Normal

   b. Laboratory Examination

      Urinalysis: Negative

      Red blood count: 5,150,000

      Hemoglobin: 100% 16.1 mgm. per 100 cc.

   c. Oto-rhinolaryngeal Examination

      History: No ear trouble. No deafness.

      Examination:

         Throat: Negative

         Nose: Negative

         Ears: Negative. Audiogram normal.

      Advice: None

      Diagnosis: None

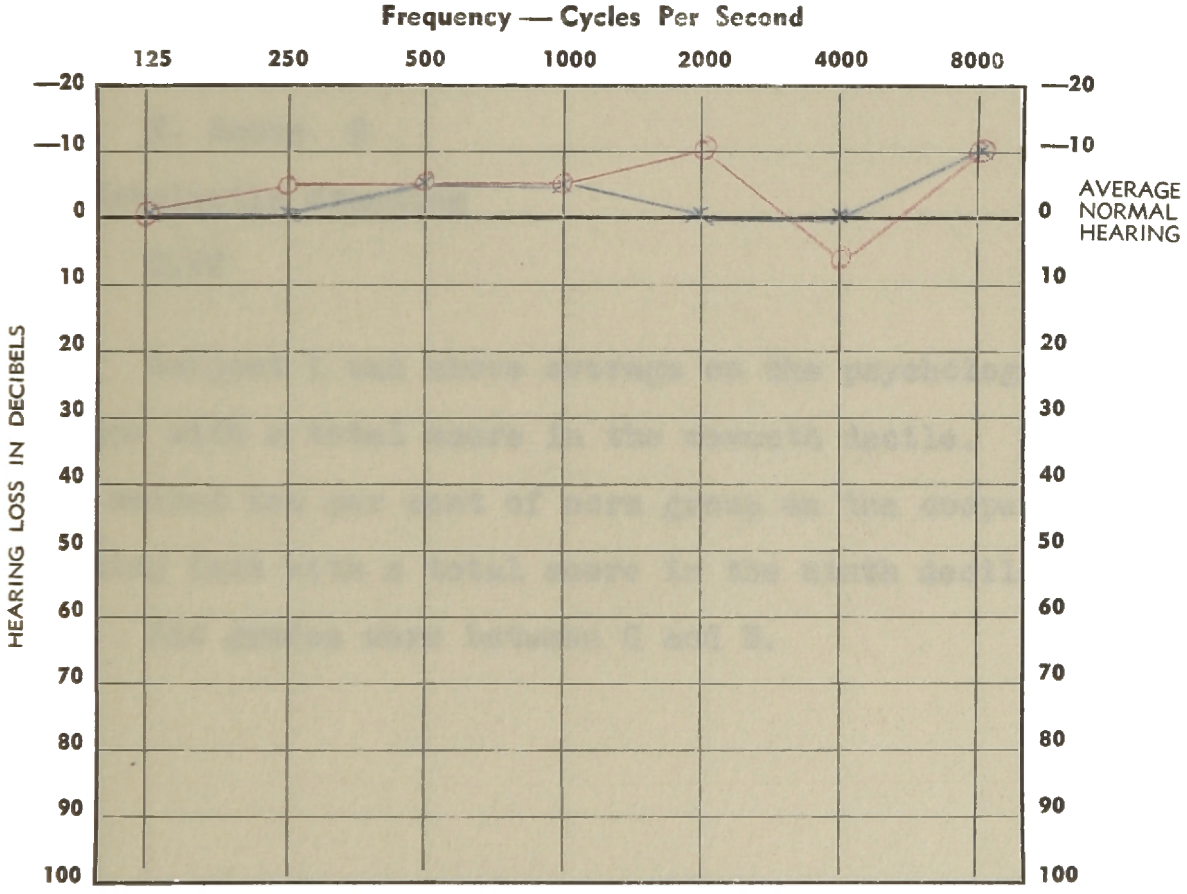
The medical findings were all negative or within normal limits. They revealed no conditions or abnormalities pertinent to this study.

Audiogram 1

Date 11/2/51 Time 8:00 A.M.

Name Subject 1 Test Clinic

	Inside Room	Outside
Temperature		24° F.
Relative Humidity		85%
Barometric Pressure		29.24 Falling
Wind		WSW 4



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Subject 1

2. Test Scores

Psychological Examination

Q. Score 5

L. Score 8

T. Score 7

Cooperative Reading Test

V. Score 9

R. Score 8

C. Score 9

T. Score 9

3. Scholastic Standing

2.52

Subject 1 was above average on the psychological examination with a total score in the seventh decile. He was in the second ten per cent of norm group on the cooperative reading test with a total score in the ninth decile.

His grades were between C and B.

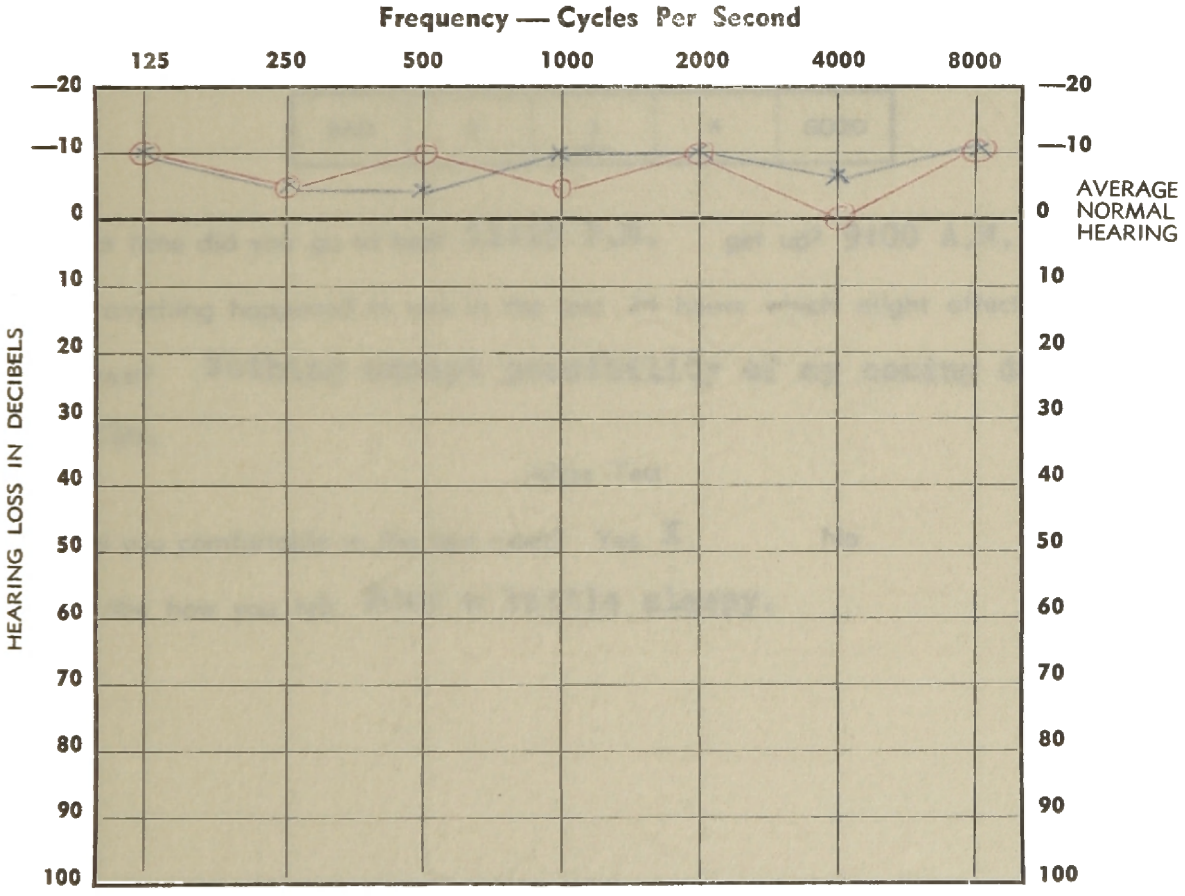
Audiogram 2

Date 4/11/52 Time 4:45 P.M.

Name Subject 1 Test 1

	Inside Room	Outside
Temperature	70° F	41° F.
Relative Humidity	50%	57%
Barometric Pressure	29.67 Falling	29.48 Falling

Wind ENE 17



Air Conduction - - - - - -

O Right Ear ———

X Left Ear - - - -

with masking

△ Right Ear at - - - -

□ Left Ear at — - - -

Bone Conduction — — — — —

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/11/54	Time	4:45 P.M.
Name	Subject 1	Test	1
	Before Test		After Test
Pulse	84		80
Temperature	97.0°		97.0°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Physically weak. Probably getting flu.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:15 P.M. get up? 9:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing except possibility of my coming down with flu.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Just a little sleepy.

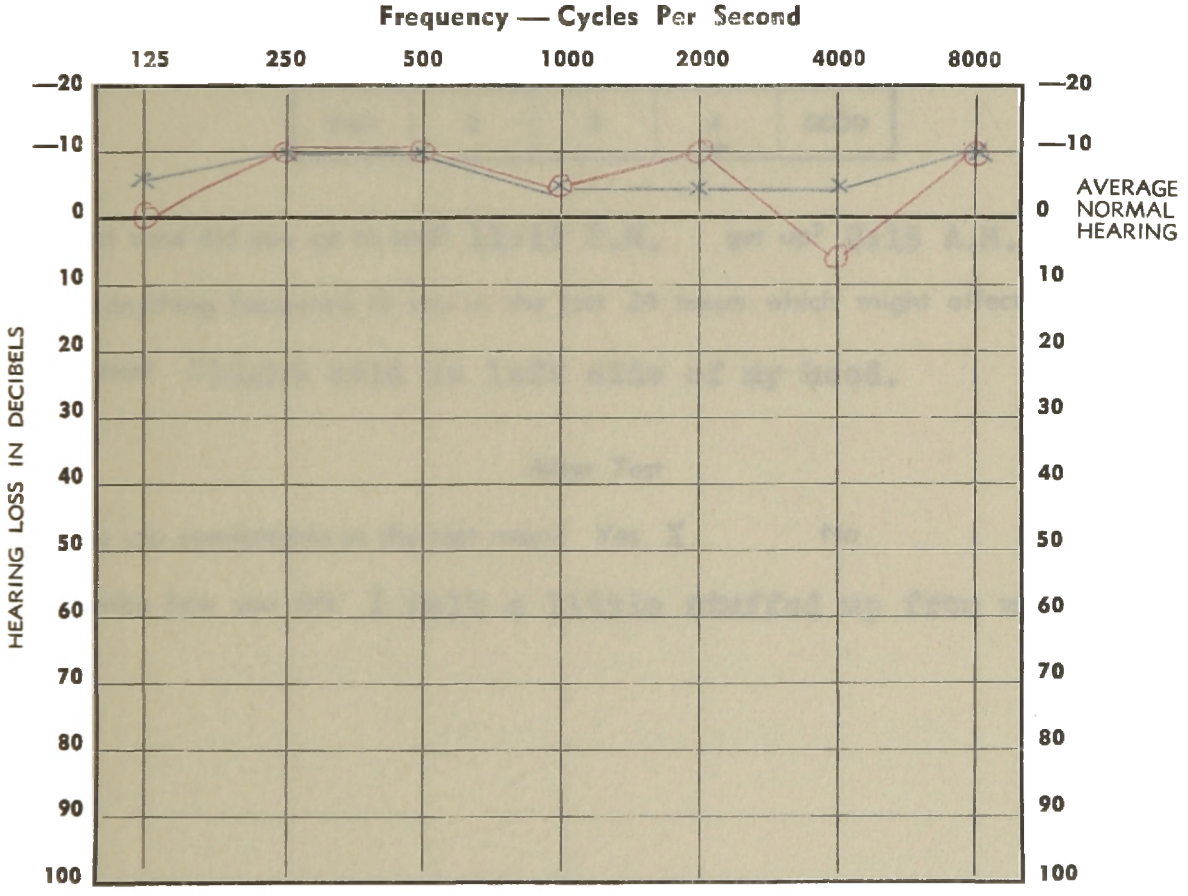
8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Audiogram 3

Date 4/15/52 Time 8:00 A.M.

Name Subject 1 Test 2

	Inside Room	Outside
Temperature	70° F.	39° F.
Relative Humidity	65%	76% Light Rain
Barometric Pressure	29.20 Rising	29.03 Rising
		Wind NNW 15



Air Conduction ———————

O Right Ear - - - -

X Left Ear ———

with masking

△ Right Ear at - - - -

□ Left Ear at - - - -

Bone Conduction — — — — —

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/15/52	Time	8:00 A.M.
Name	Subject 1	Test	2
	Before Test		After Test
Pulse	92		92
Temperature	98.2°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Good. No worries.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:15 P.M. get up? 8:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Slight cold in left side of my head.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I felt a little stuffed up from my cold.

8. Comments by operator: Consistent threshold at each frequency.

Signal lights: No delay.

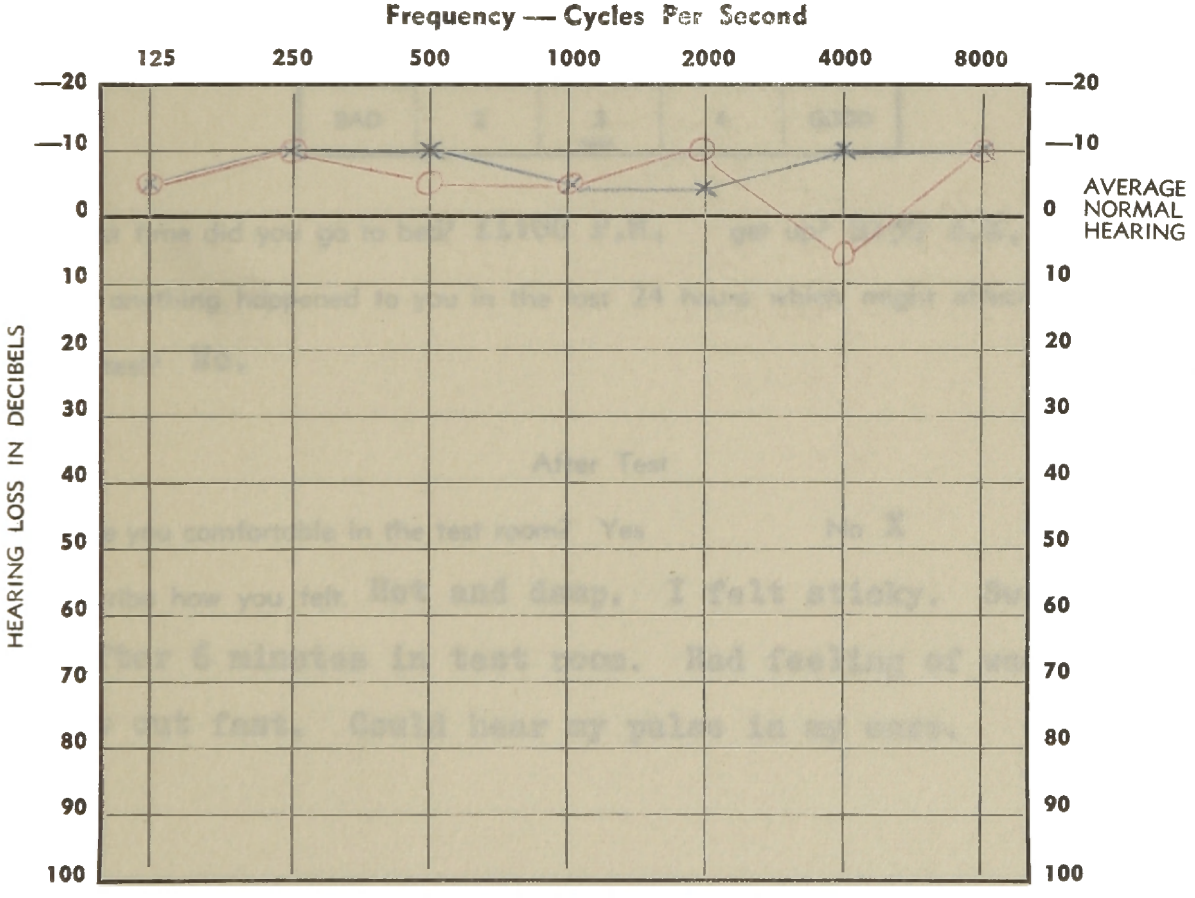
Questionnaire 2

Audiogram 4

Date 4/18/52 Time 1:30 P.M.

Name Subject 1 Test 3

	Inside Room	Outside
Temperature	90° F.	70° F.
Relative Humidity	65%	40%
Barometric Pressure	29.40 Falling	29.19 Falling
		Wind W 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/18/52	Time	1:30 P.M.
Name	Subject 1	Test	3
	Before Test		After Test
Pulse	96		100
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. Very good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		X		

4. What time did you go to bed? 11:00 P.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Hot and damp. I felt sticky. Sweating began after 6 minutes in test room. Had feeling of wanting to get out fast. Could hear my pulse in my ears.

8. Comments by operator: Signal lights: 5 to 9 seconds delay. Profuse sweating. Nervous movements during waiting period.

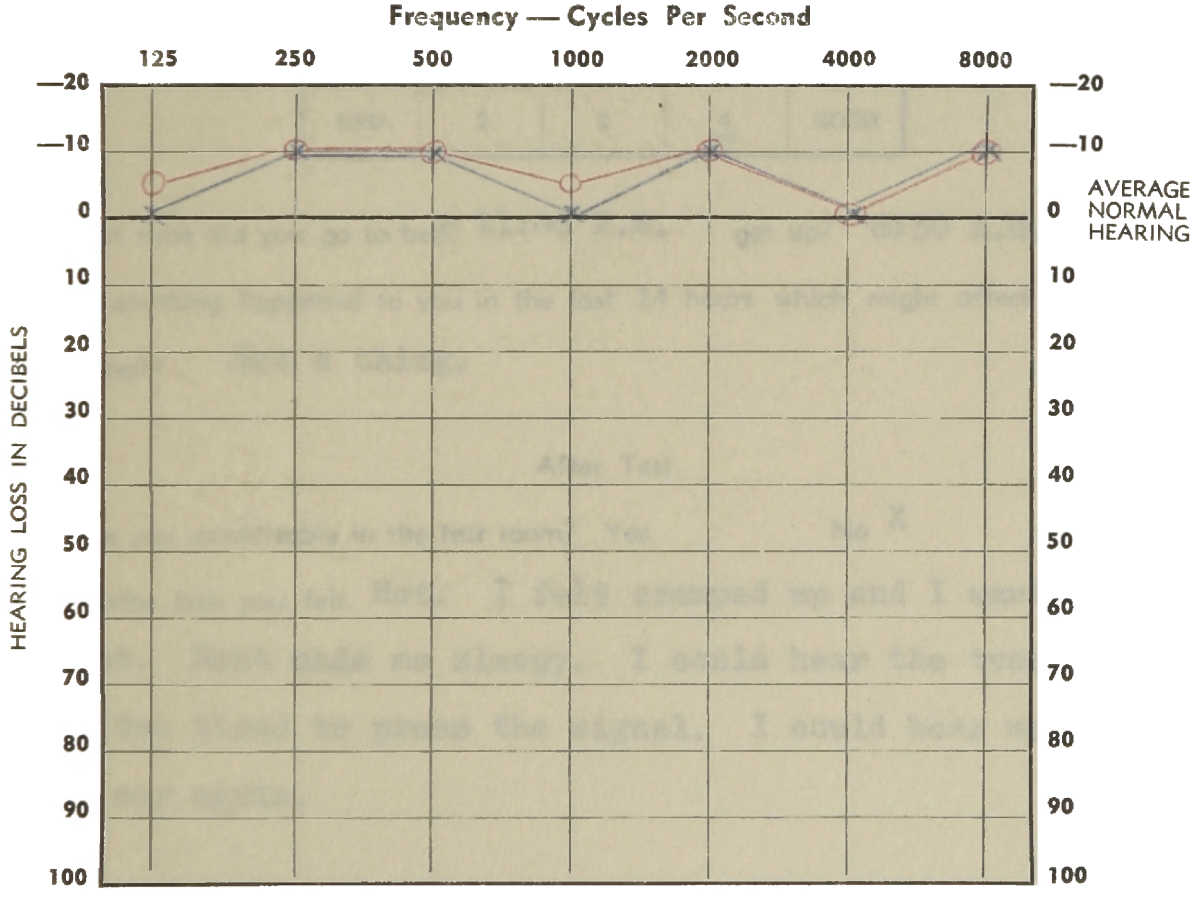
Questionnaire 3

Audiogram 5

Date 4/28/52 Time 1:30 P.M.

Name Subject 1 Test 4

	Inside Room	Outside
Temperature	90° F.	70° F.
Relative Humidity	80%	44%
Barometric Pressure	29.10 Rising	28.98 Rising
Wind	N 20	



Air Conduction - - - - - -

O Right Ear ——— ·

X Left Ear ———

with masking

△ Right Ear at - - - -

□ Left Ear at - - - -

Bone Conduction ——— · ——— ·

|> Right Ear with masking at - - - -

<| Left Ear with masking at - - - -

Date	4/28/52	Time	1:30 P.M.
Name	Subject 1	Test	4
	Before Test		After Test
Pulse	89		100
Temperature	98.8°		98.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Good. I think I have Spring Fever.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Not a thing.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Hot. I felt cramped up and I wanted to get out. Heat made me sleepy. I could hear the tone, but I was too tired to press the signal. I could hear my pulse in my ear again.

8. Comments by operator: Profuse sweating after 6 minutes. Signal lights: 9 to 12 seconds delay. Nervous movements during waiting period.

Questionnaire 4

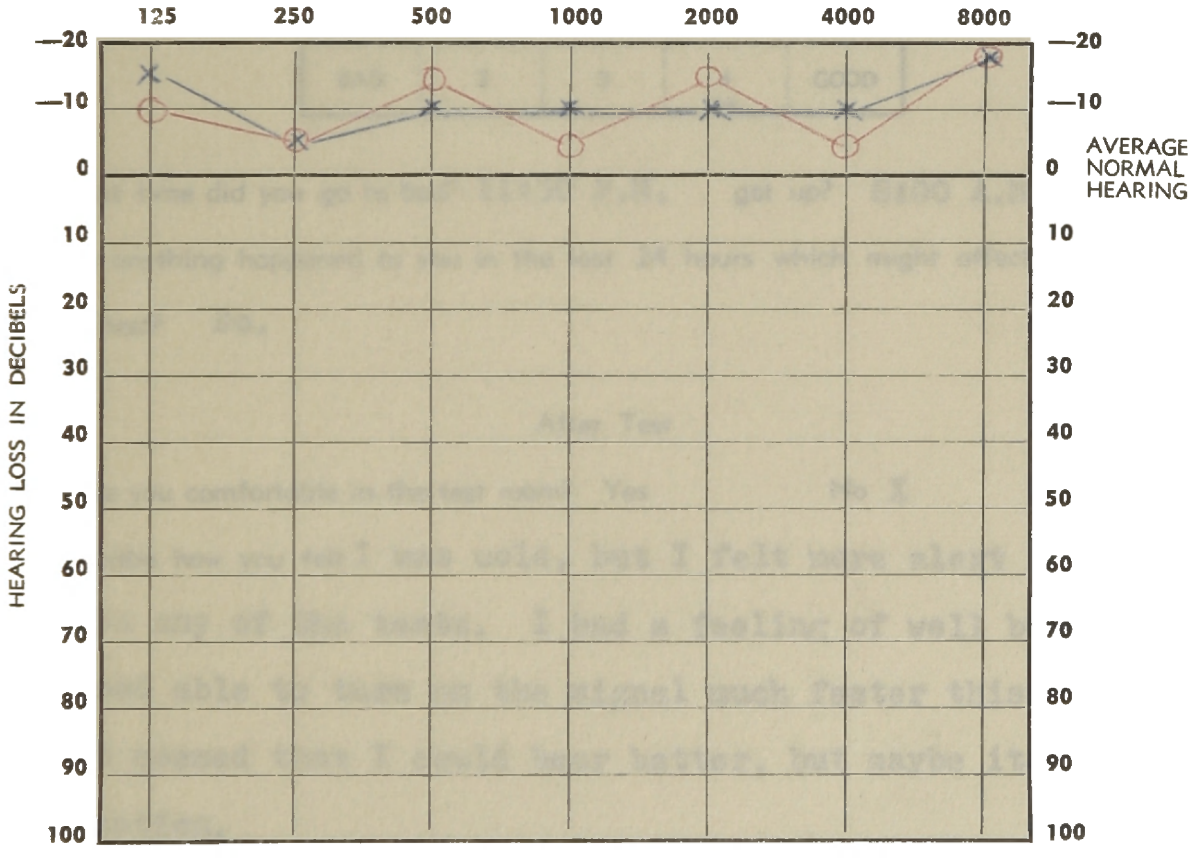
Audiogram 6

Date 5/2/52 Time 2:00 P.M.

Name Subject 1 Test 5

	Inside Room	Outside
Temperature	50° F.	64° F.
Relative Humidity	70%	36%
Barometric Pressure	29.27 Steady	29.09 Steady
		Wind NNW 14

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/2/52	Time	2:00 P.M.
Name	Subject 1	Test	5
	Before Test		After Test
Pulse	92		72
Temperature	98.6°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Good. Anticipation of a good week end.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was cold, but I felt more alert than I have on any of the tests. I had a feeling of well being. I seemed able to turn on the signal much faster this time, and it seemed that I could hear better, but maybe it was just imagination.

8. Comments by operator: Signal lights: No delay. Seemed relaxed during rest period.

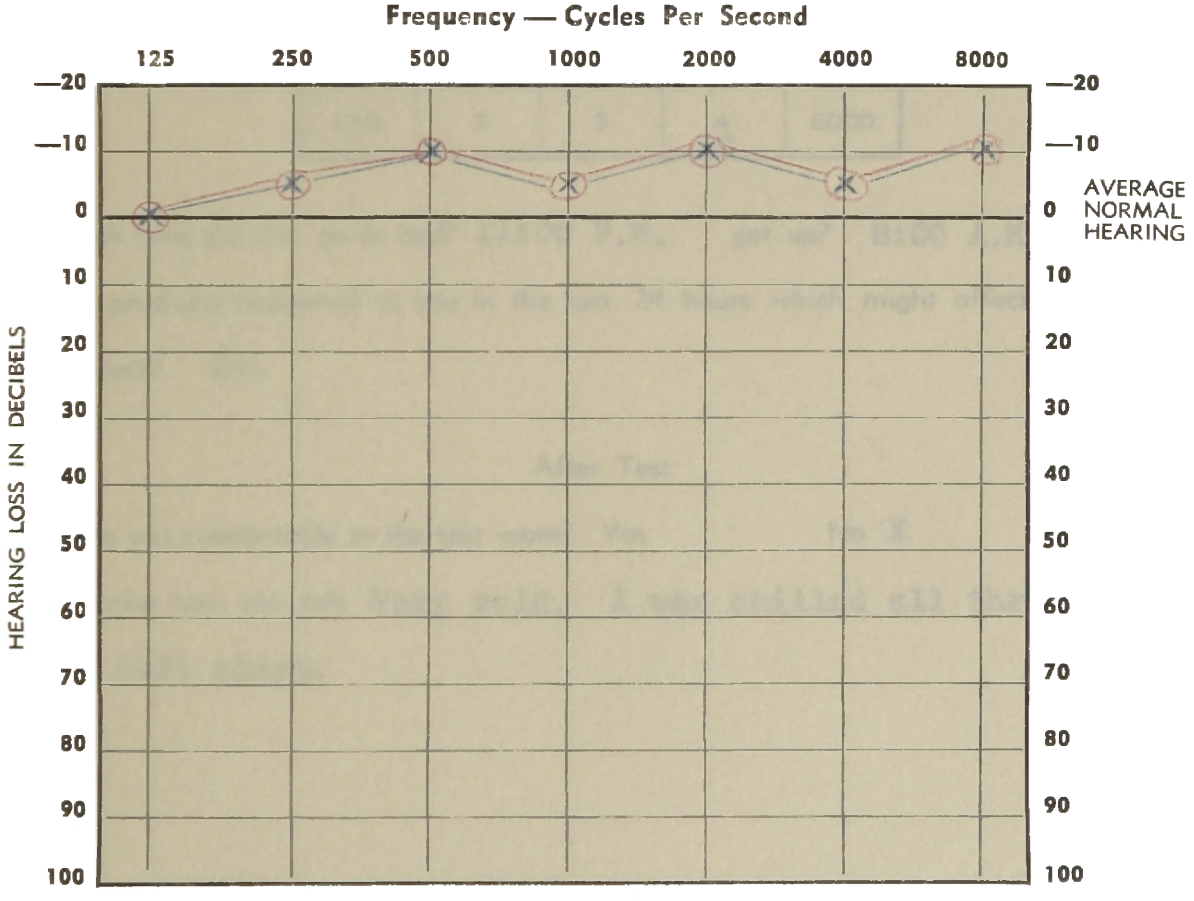
Questionnaire 5

Audiogram 7

Date 5/5/52 Time 2:00 P.M.

Name Subject 1 Test 6

	Inside Room	Outside
Temperature	20° F.	85° F.
Relative Humidity	80%	36%
Barometric Pressure	28.95 Steady	28.80 Steady
Wind		NNW 21



Air Conduction - - - - - -

O Right Ear .....

X Left Ear ——————

with masking

△ Right Ear at - - - -

□ Left Ear at ——————

Bone Conduction ——————

|> Right Ear with masking at .....

<| Left Ear with masking at .....

Date	5/5/52	Time	2:15 P.M.
Name	Subject 1	Test	6
	Before Test		After Test
Pulse	80		76
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Good spirits. Just a little beat from the heat.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Very cold. I was chilled all through, but I felt alert.

8. Comments by operator: Nose running after 5 minutes. Ears pink after 20 minutes. Consistent threshold at each frequency. Signal lights: No delay.

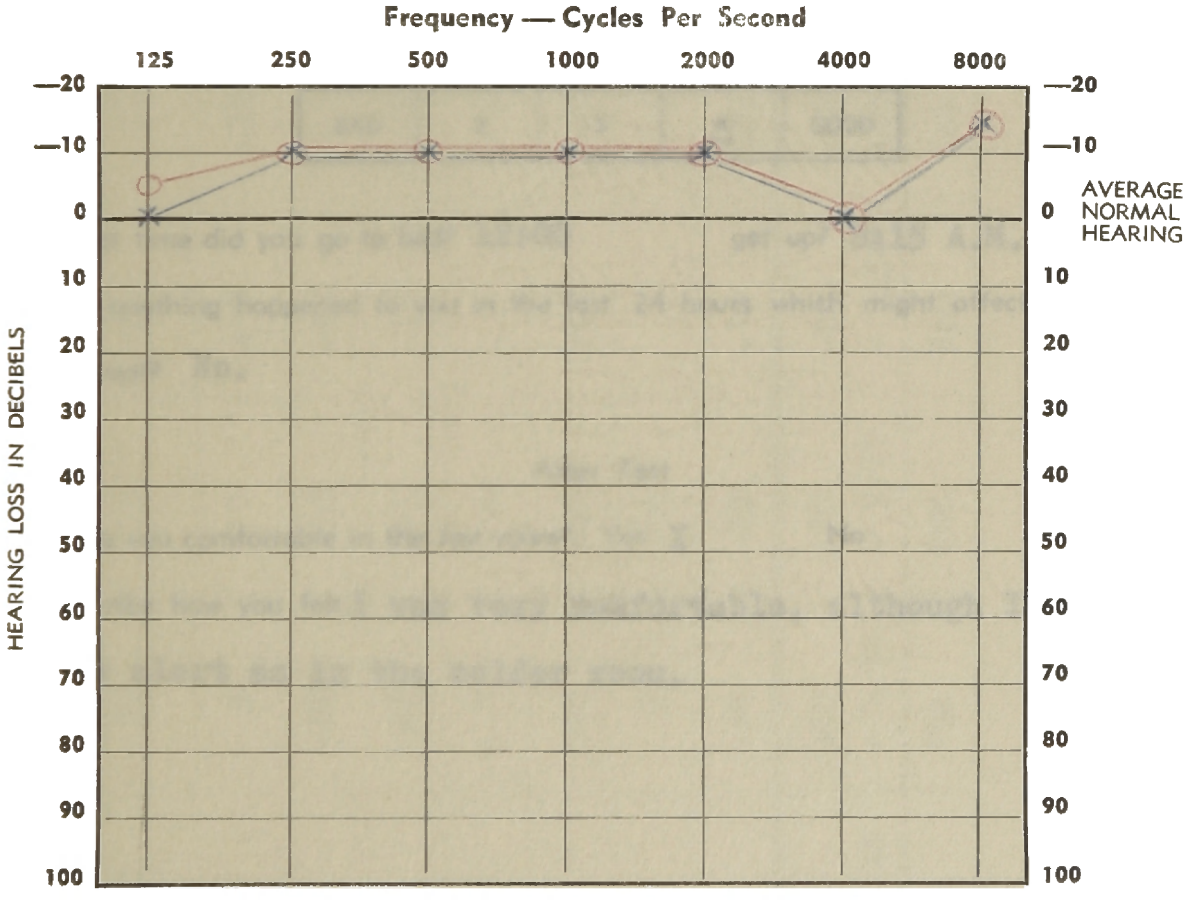
Questionnaire 6

Audiogram 8

Date 5/12/52 Time 2:00 P.M.

Name Subject 1 Test 7

	Inside Room	Outside
Temperature	70° F.	50° F.
Relative Humidity	50%	71% Raining
Barometric Pressure	28.90 Steady	28.70 Steady
Wind		W 22



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/12/52	Time	2:00 P.M.
Name	Subject 1	Test	7
	Before Test		After Test
Pulse	80		84
Temperature	98.4°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 8:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was very comfortable, although I was not as alert as in the colder room.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay. Seemed relaxed in test room.

Questionnaire 7

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	-10	0	- 5	- 5	-10	0	- 5	10
250	- 5	-10	-10	-10	- 5	- 5	-10	5
500	-10	-10	- 5	-10	-15	-10	-10	10
1000	- 5	- 5	- 5	- 5	- 5	- 5	-10	5
2000	-10	-10	-10	-10	-15	-10	-10	5
4000	0	5	5	0	- 5	- 5	0	10
8000	-10	-10	-10	-10	-20	-10	-15	10
Loss in db ≤ Loss Ave. Loss	-50 - 7.14	-40 - 5.71	-40 - 5.71	-50 - 7.14	-75 -10.71	-45 - 6.42	-60 - 8.57	35 5.00
Rank	3rd	7th	7th	3rd	1st	5th	2nd	

Maximum Deviation of 35 (5.00) Decibels

Between 50° 70% and (90° 65%
(70° 65%

Subject 1

Right Ear

TABLE I

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	-10	- 5	- 5	0	-15	0	0	15
250	- 5	-10	-10	-10	- 5	- 5	-10	5
500	- 5	-10	-10	-10	-10	-10	-10	5
1000	-10	- 5	- 5	0	-10	- 5	-10	10
2000	-10	- 5	- 5	-10	-10	-10	-10	5
4000	- 5	- 5	-10	0	-10	- 5	0	10
8000	-10	-10	-10	-10	-20	-10	-15	10
Loss in db Σ Loss Ave. Loss	-55 - 7.86	-50 - 7.14	-55 - 7.86	-40 - 5.71	-80 -11.42	-45 - 6.42	-55 - 7.86	40 5.71
Rank	2nd	5th	2nd	7th	1st	6th	2nd	

Maximum Deviation of 40 (5.71) Decibels Subject 1

Between 50° 70% and 90° 80% Left Ear

TABLE II

Subject 2

1. Medical Findings

a. Physical Examination

Age: 23

Height: 73"

Weight: 187

Chest X-Ray: Negative

Heart and lungs: Normal

Blood pressure: 120/70

Spur on left septum

Tonsils present and small

b. Laboratory Examination

Urinalysis: Negative

Red blood count: 4,650,000

Hemoglobin: 97% 16.1 mgm. per 100 cc.

c. Oto-rhinolaryngeal Examination

History: No ear trouble

Examination:

Mouth: Good occlusion

Throat: Moderate sized tonsils with small adenoid mass not encroaching on ostia

Nose: Acute rhinitis

Advice: No treatment

Diagnosis: Acute rhinitis

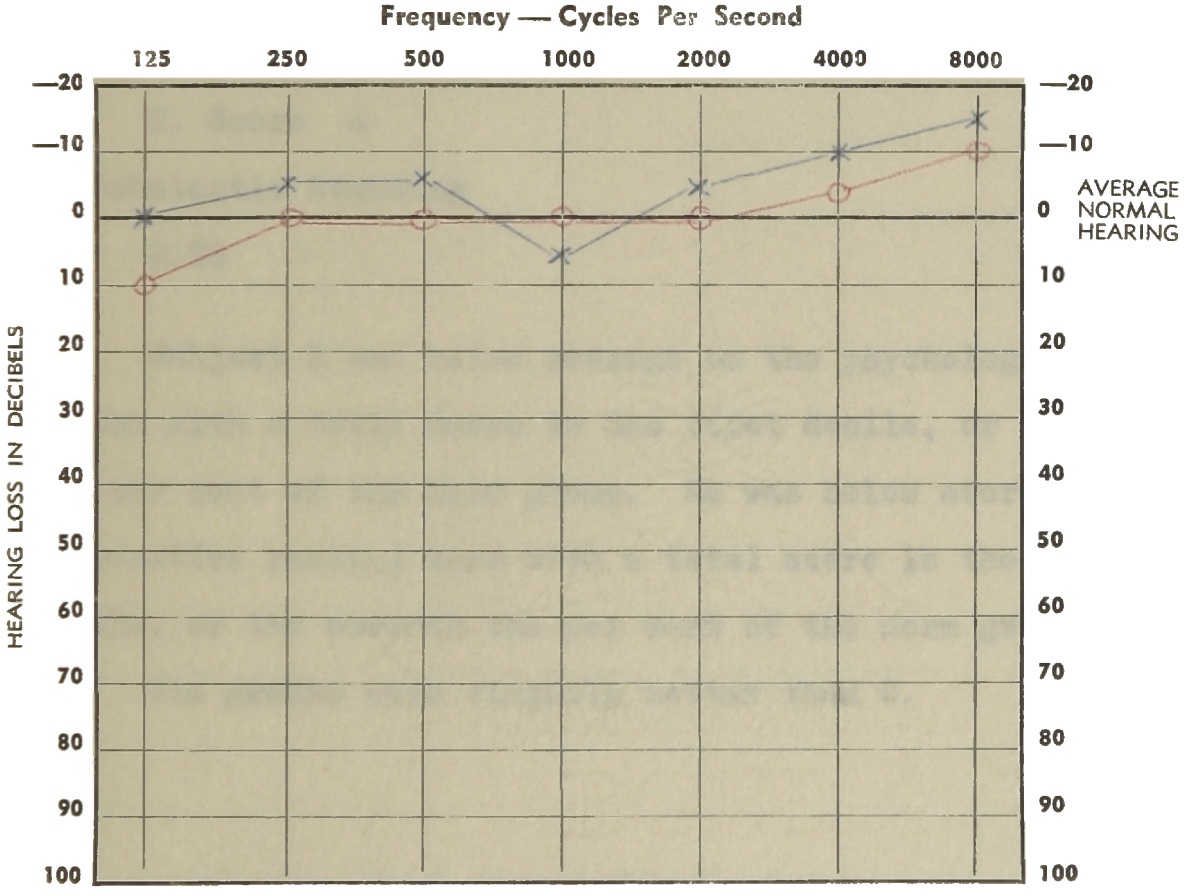
The medical findings were all negative or within normal limits. The diagnosis of acute rhinitis was pertinent to this study.

Audiogram 9

Date 11/5/51 Time 2:00 P.M.

Name Subject 2 Test Clinic

	Inside Room	Outside
Temperature		66° F.
Relative Humidity		79%
Barometric Pressure		28.97 Rising
		Wind WSW 16



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

[> Right Ear with masking at

<] Left Ear with masking at

Subject 2

2. Test Scores

Psychological Examination

Q. Score 2

L. Score 2

T. Score 1

Cooperative Test of Reading Comprehension

V. Score 6

R. Score 3

C. Score 4

T. Score 4

3. Scholastic Standing

2.28

Subject 2 was below average on the psychological examination with a total score in the first decile, or the lowest ten per cent of the norm group. He was below average on the cooperative reading test with a total score in the fourth decile, or the seventh ten per cent of the norm group.

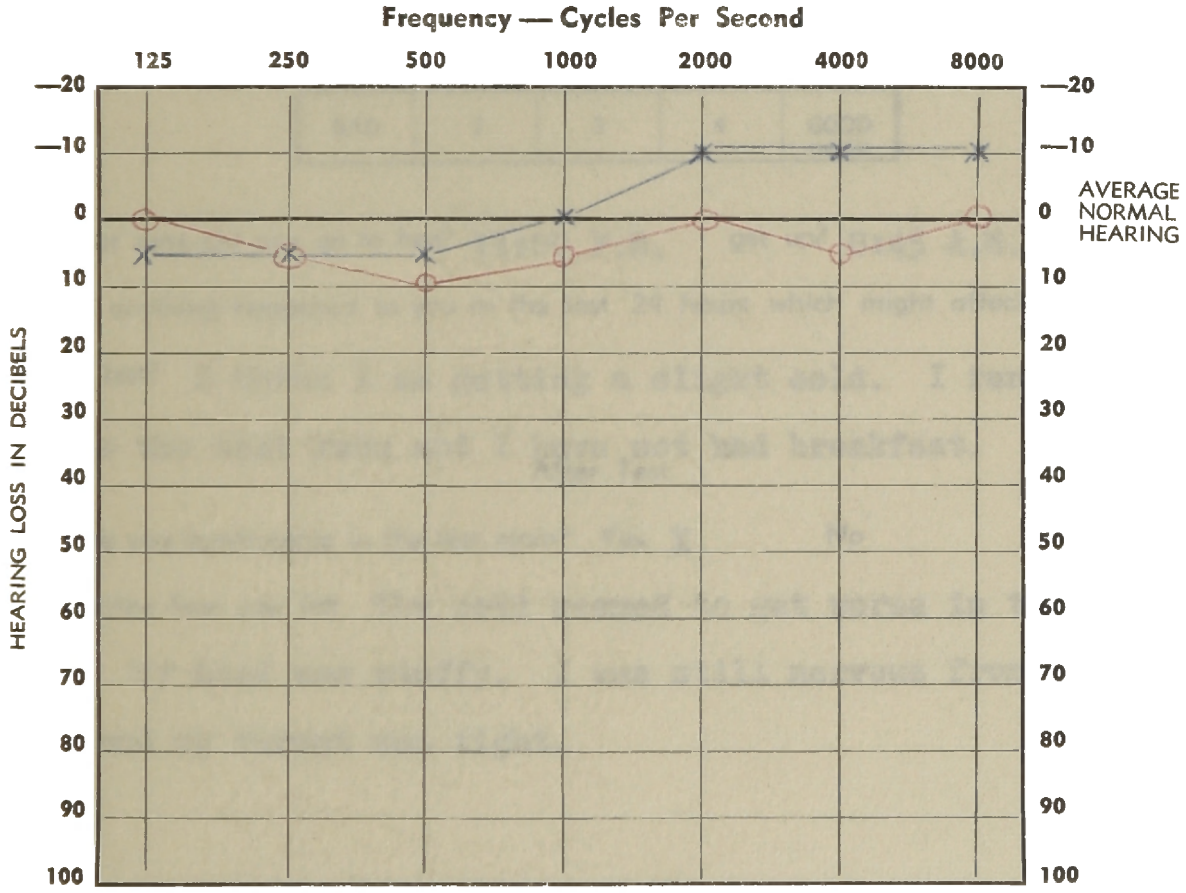
His grades were slightly better than C.

Audiogram 10

Date 4/8/52 Time 9:00 A.M.

Name Subject 2 Test 1

	Inside Room	Outside
Temperature	70° F.	39° F
Relative Humidity	50%	96%
Barometric Pressure	29.50 Steady	29.31 Steady
Wind	Calm	



Air Conduction - - - - - -

O Right Ear ——— ——

X Left Ear ———

with masking

△ Right Ear at - - - -

□ Left Ear at ——— ——

Bone Conduction ——————

|> Right Ear with masking at - - -

<| Left Ear with masking at

Date	4/8/52	Time	9:00 A.M.
Name	Subject 2	Test	1
	Before Test		After Test
Pulse	100		76
Temperature	97.6°		97.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel good. Just a little nervous because I was late for my appointment. I overslept.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 8:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? I think I am getting a slight cold. I ran all the way to the test room and I have not had breakfast.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. The cold seemed to get worse in the test room. My head was stuffy. I was still nervous from being late and my throat was tight.

8. Comments by operator: Consistent responses at each frequency except 125 cycles, both ears.

Questionnaire 8

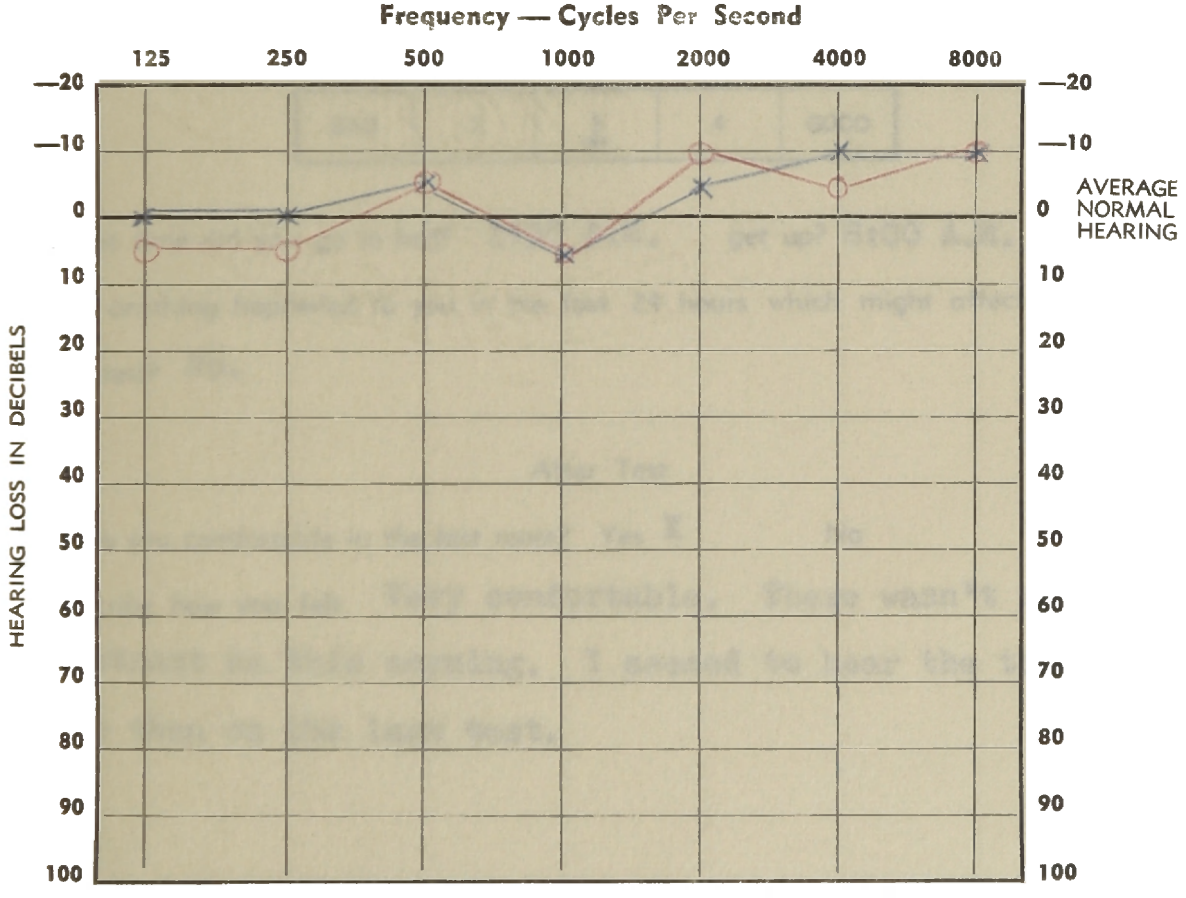
Audiogram 11

Date 4/15/52 Time 9:00 A.M.

Name Subject 2 Test 2

	Inside Room	Outside
Temperature	70° F.	39° F.
Relative Humidity	65%	76% Light Rain
Barometric Pressure	29.20 Rising	29.12 Rising

Wind NNW 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/15/52	Time	9:00 A.M.
Name	Subject 2	Test	2
	Before Test		After Test
Pulse	80		76
Temperature	97.2°		97.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Just a little tired. Otherwise good. My cold has cleared up.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:30 A.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very comfortable. There wasn't anything to distract me this morning. I seemed to hear the tones better than on the last test.

8. Comments by operator: Consistent threshold at each frequency except 125 and 250 cycles, both ears.

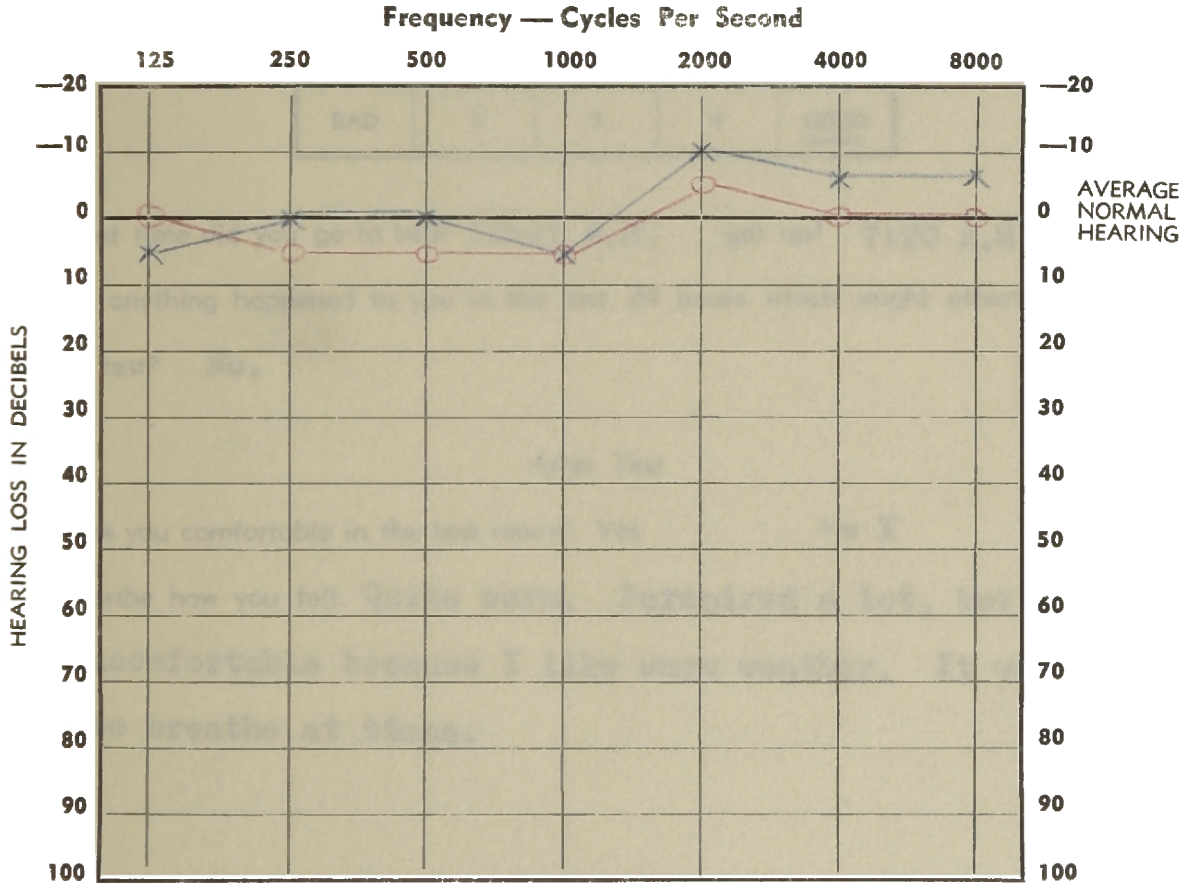
Questionnaire 9

Audiogram 12

Date 4/18/52 Time 9:00 A.M.

Name Subject 2 Test 3

	Inside Room	Outside
Temperature	90° F.	58° F.
Relative Humidity	65%	71%
Barometric Pressure	29.40 Falling	29.17 Falling
Wind	WSW 12	



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/18/52	Time	9:00 A.M.
Name	Subject 2	Test	3
	Before Test		After Test
Pulse	74		86
Temperature	99°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. The best in a long time. Very happy. A general sense of well being.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:45 A.M. get up? 7:20 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Quite warm. Perspired a lot, but I wasn't too uncomfortable because I like warm weather. It was difficult to breathe at times.

8. Comments by operator: Consistent threshold at each frequency.

Questionnaire 10

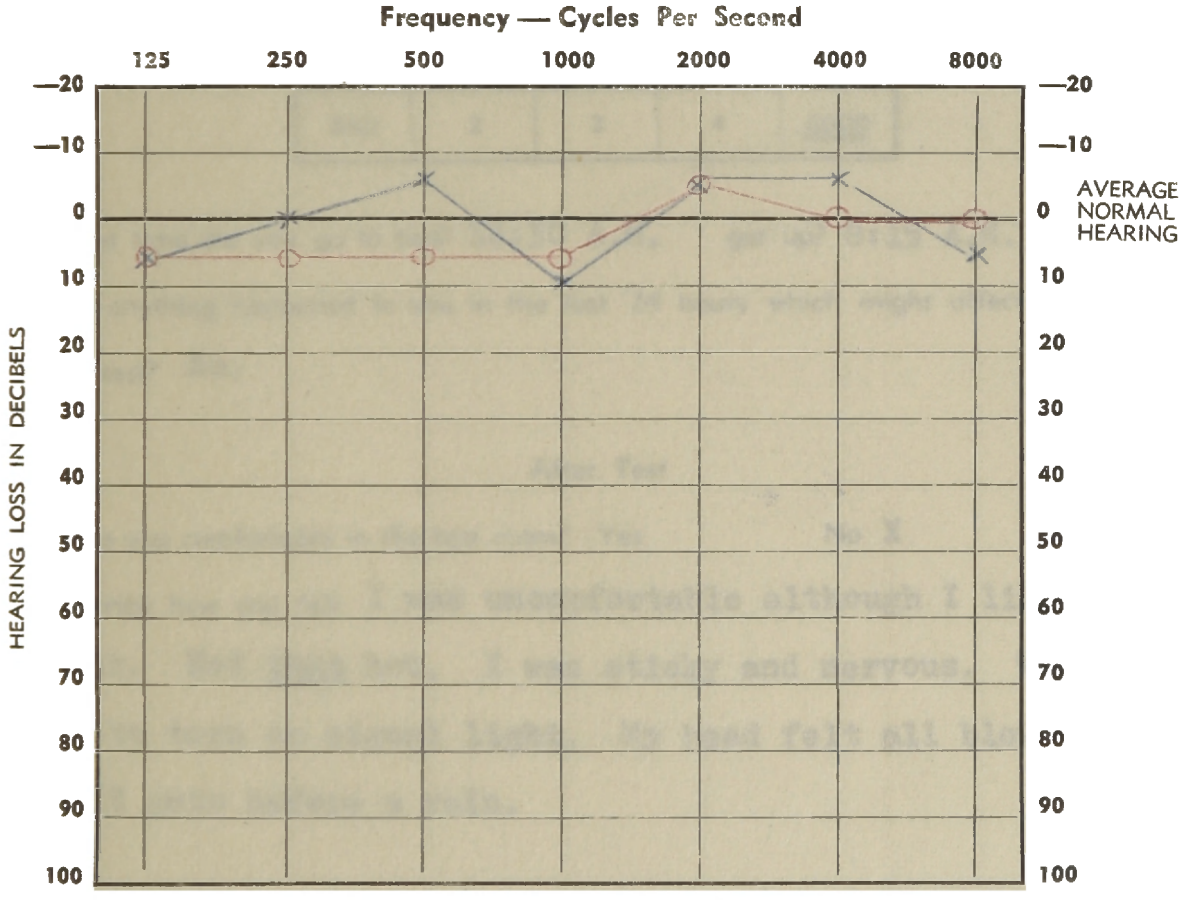
Audiogram 13

Date 4/29/52 Time 9:00 A.M.

Name Subject 2 Test 4

	Inside Room	Outside
Temperature	90° F.	56° F.
Relative Humidity	80%	80%
Barometric Pressure	29.26 Steady	29.07 Steady

Wind NNE 4



Air Conduction - - - - - -

O Right Ear ——

X Left Ear - - - - -

with masking

△ Right Ear at — — —

□ Left Ear at — — —

Bone Conduction — — — — —

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date	4/29/52	Time	9:00 A.M.
Name	Subject 2	Test	4
	Before Test		After Test
Pulse	100		96
Temperature	98.4°		99.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Rested and relaxed.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 8:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was uncomfortable although I like hot weather. Not that hot. I was sticky and nervous. Too tired to turn on signal light. My head felt all blown up like it gets before a rain.

8. Comments by operator: Signal lights: 8 to 12 seconds delay. Flickering lights after interrupter had cut out tone.

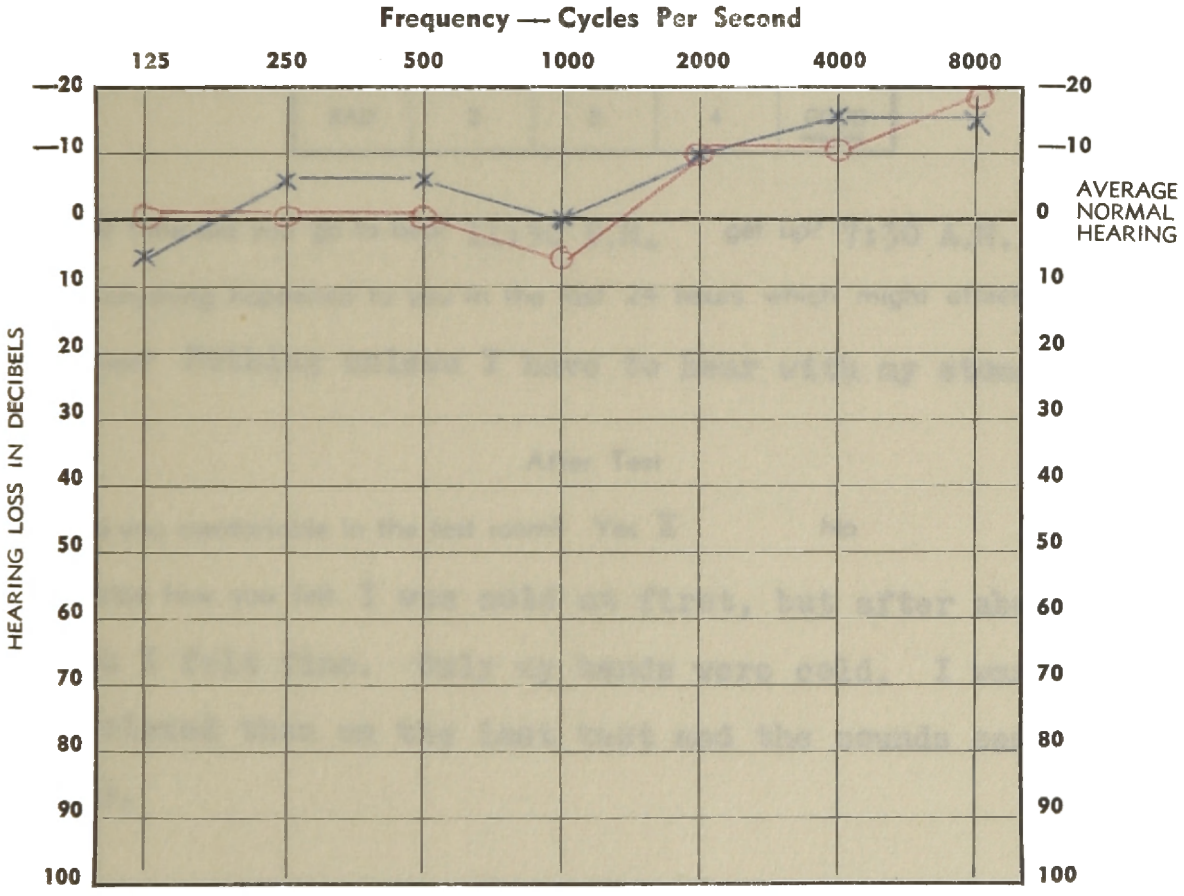
Questionnaire 11

Audiogram 14

Date 5/2/52 Time 9:00 A.M.

Name Subject 2 Test 5

	Inside Room	Outside
Temperature	50° F.	52° F.
Relative Humidity	70%	79%
Barometric Pressure	29.27 Steady	29.06 Steady
		Wind NNE 15



Air Conduction - - - -

O Right Ear ----

X Left Ear ----

with masking

△ Right Ear at ----

□ Left Ear at ----

Bone Conduction — — — — —

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date	5/2/52	Time	9:00 A.M.
Name	Subject 2	Test	5
	Before Test		After Test
Pulse	80		74
Temperature	97.8°		98.0°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Tired. Have an upset stomach and a slight headache.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing unless I have to hear with my stomach!

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was cold at first, but after about 10 minutes I felt fine. Only my hands were cold. I was much more relaxed than on the last test and the sounds seemed clearer.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

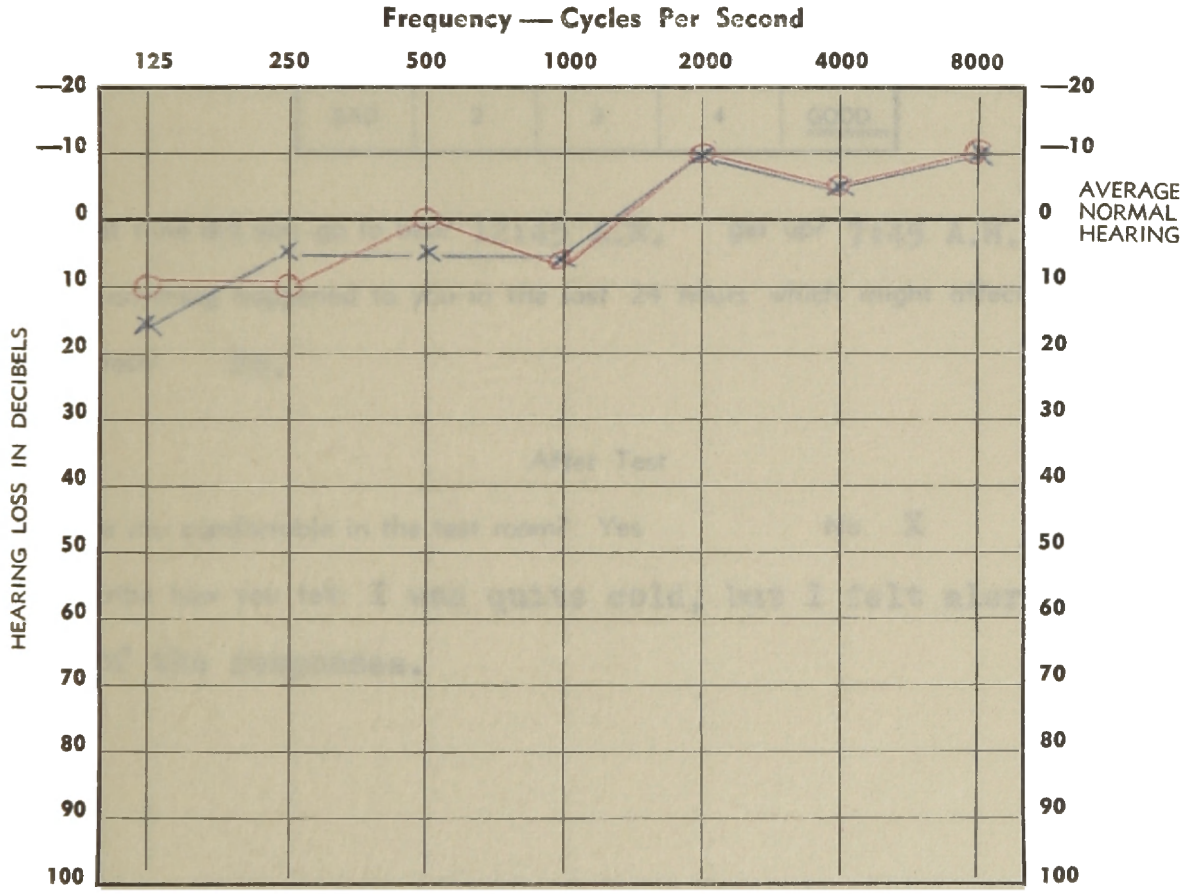
Questionnaire 12

Audiogram 15

Date 5/6/52 Time 9:00 A.M.

Name Subject 2 Test 6

	Inside Room	Outside
Temperature	20° F.	61° F.
Relative Humidity	80%	59%
Barometric Pressure	29.12 Rising	28.92 Rising
Wind	W 17	



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at _____

Bone Conduction _____

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date	5/6/52	Time	9:00 A.M.
Name	Subject 2	Test	6

	Before Test	After Test
Pulse	90	82
Temperature	97.2°	97.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. A little tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:45 A.M. get up? 7:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was quite cold, but I felt alert and sure of the responses.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

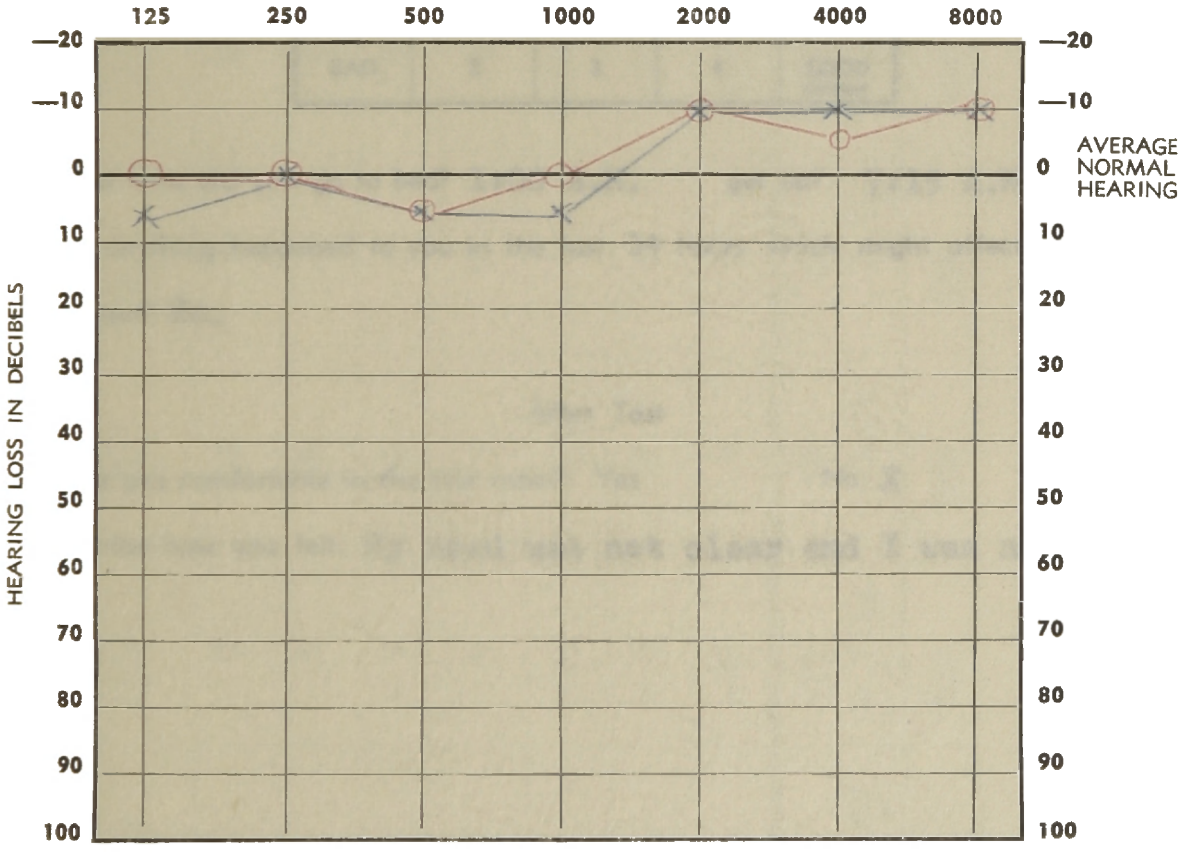
Audiogram 16

Date 5/13/52 Time 9:00 A.M.

Name Subject 2 Test 7

	Inside Room	Outside
Temperature	70° F.	52° F.
Relative Humidity	50%	65%
Barometric Pressure	28.96 Rising	28.86 Rising
		Wind W 20

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/13/52	Time	9:00 A.M.
Name	Subject 2	Test	7
	Before Test		After Test
Pulse	96		72
Temperature	98°		98°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I have had a cold since Friday and my head is still stuffy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:00 A.M. get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. My head was not clear and I was not relaxed.

8. Comments by operator: Consistent threshold at each frequency, except 125 and 250 cycles, both ears.

Questionnaire 14

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	5	0	5	0	10	0	10
250	5	5	5	5	0	10	0	10
500	10	- 5	5	5	0	0	5	15
1000	5	5	5	5	5	5	0	5
2000	0	-10	- 5	- 5	-10	-10	-10	10
4000	5	- 5	0	0	-10	- 5	- 5	15
8000	0	-10	0	0	-20	-10	-10	20
Loss in db	25	-15	10	15	-35	0	-20	60
Σ Loss Ave. Loss	3.57	- 2.14	1.42	2.14	- 5.00	.00	- 2.86	8.57
Rank	7th	3rd	5th	6th	1st	4th	2nd	

Maximum Deviation of 60 (8.57) Decibels Subject 2

Between 50° 70% and 70° 50% Right Ear

TABLE III

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	5	0	5	5	5	15	5	15
250	5	0	0	0	- 5	5	0	10
500	5	- 5	0	- 5	- 5	5	5	10
1000	0	5	5	10	0	5	5	10
2000	-10	- 5	-10	- 5	-10	-10	-10	5
4000	-10	-10	- 5	- 5	-15	- 5	-10	10
8000	-10	-10	- 5	5	-15	-10	-10	20
Loss in db $\leq$ Loss Ave. Loss	-15 - 2.14	-25 - 3.57	-10 - 1.42	5 .72	-45 - 6.42	5 .72	-15 - 2.14	50 7.14
Rank	3rd	2nd	5th	7th	1st	7th	3rd	

Maximum Deviation of 50 (7.14) Decibels

Between 50° 70% and (20° 80%
(90° 80%

Subject 2

Left Ear

TABLE IV

Subject 3

1. Medical Findings

a. Physical Examination

Age: 23

Height: 67"

Weight: 160

Heart and lungs: Normal

Chest X-Ray: Negative

Blood pressure: 120/70

Abdomen: Normal

Permanent perforation of right tympanum

Nose shows hypertrophic turbinates

b. Laboratory Examination

Urinalysis:

Specific gravity 1.27

Albumin negative

Sugar negative

Red blood count: 4,840,000

Hemoglobin: 96%

White blood count: 6,850

c. Oto-rhinolaryngeal Examination

History: No history of deafness. Ear infection in childhood; none since.

Examination of Throat: Negative

Nose: Hypertrophic turbinates

Ears: Perforated tympanum right.

Audiogram normal.

Advice: No treatment

Diagnosis: Perforated right tympanum

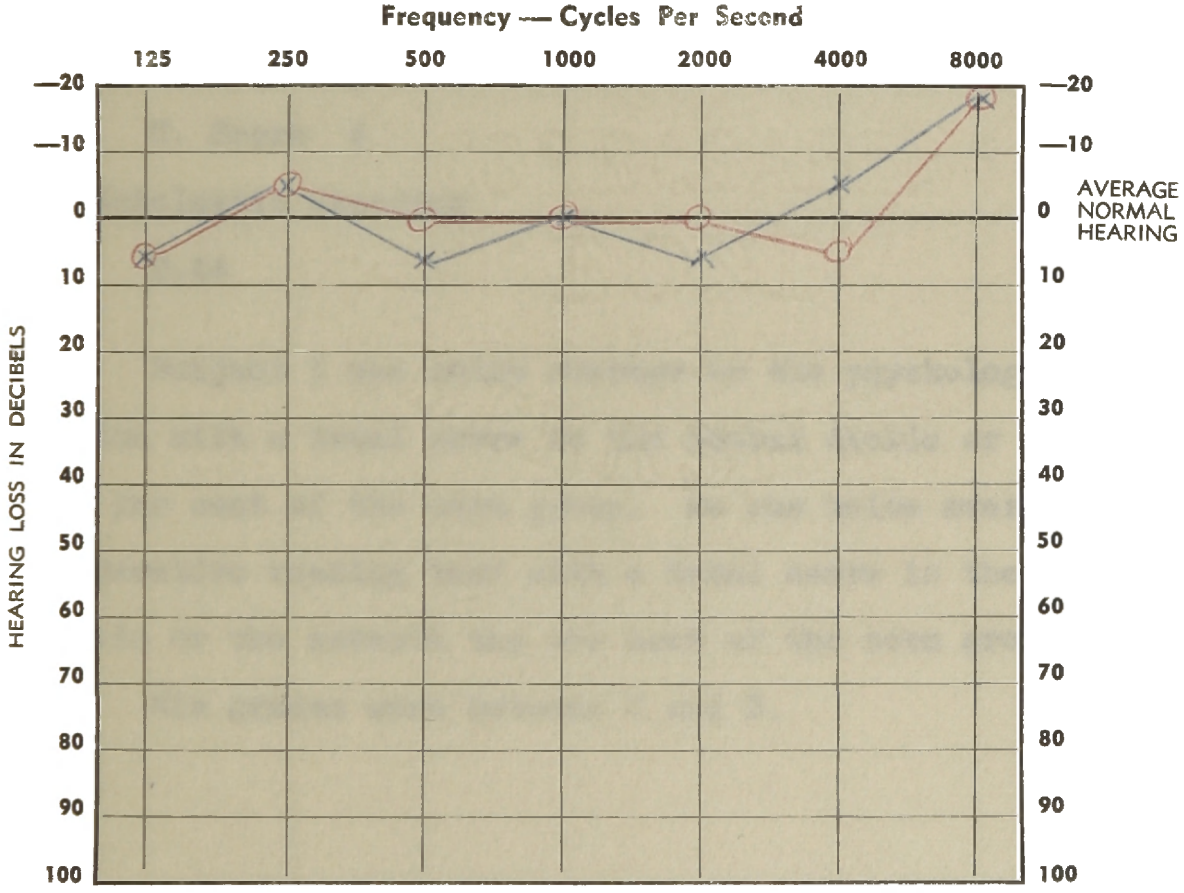
The general physical condition of Subject 3 was good. All laboratory findings were negative or within normal limits. Although there was no history of deafness and the audiogram revealed normal hearing, the diagnosis of hypertrophic turbinates and perforated tympanum right was pertinent to this study.

Audiogram 17

Date 11/1/51 Time 8:15 A.M.

Name Subject 3 Test Clinic

	Inside Room	Outside
Temperature		29° F.
Relative Humidity		81%
Barometric Pressure		29.22 Steady
Wind		NW 8



Air Conduction - - - - - -

O Right Ear _ _ _ _ _

X Left Ear ——

with masking

△ Right Ear at - - -

□ Left Ear at ——

Bone Conduction — — — — —

|> Right Ear with masking at - -

<| Left Ear with masking at - -

Subject 3

2. Test Scores

Psychological Examination

Q. Score 1

L. Score 6

T. Score 2

Cooperative Test of Reading Comprehension

V. Score 4

R. Score 3

C. Score 5

T. Score 4

3. Scholastic Standing

2.44

Subject 3 was below average on the psychological examination with a total score in the second decile or the ninth ten per cent of the norm group. He was below average on the cooperative reading test with a total score in the fourth decile or the seventh ten per cent of the norm group.

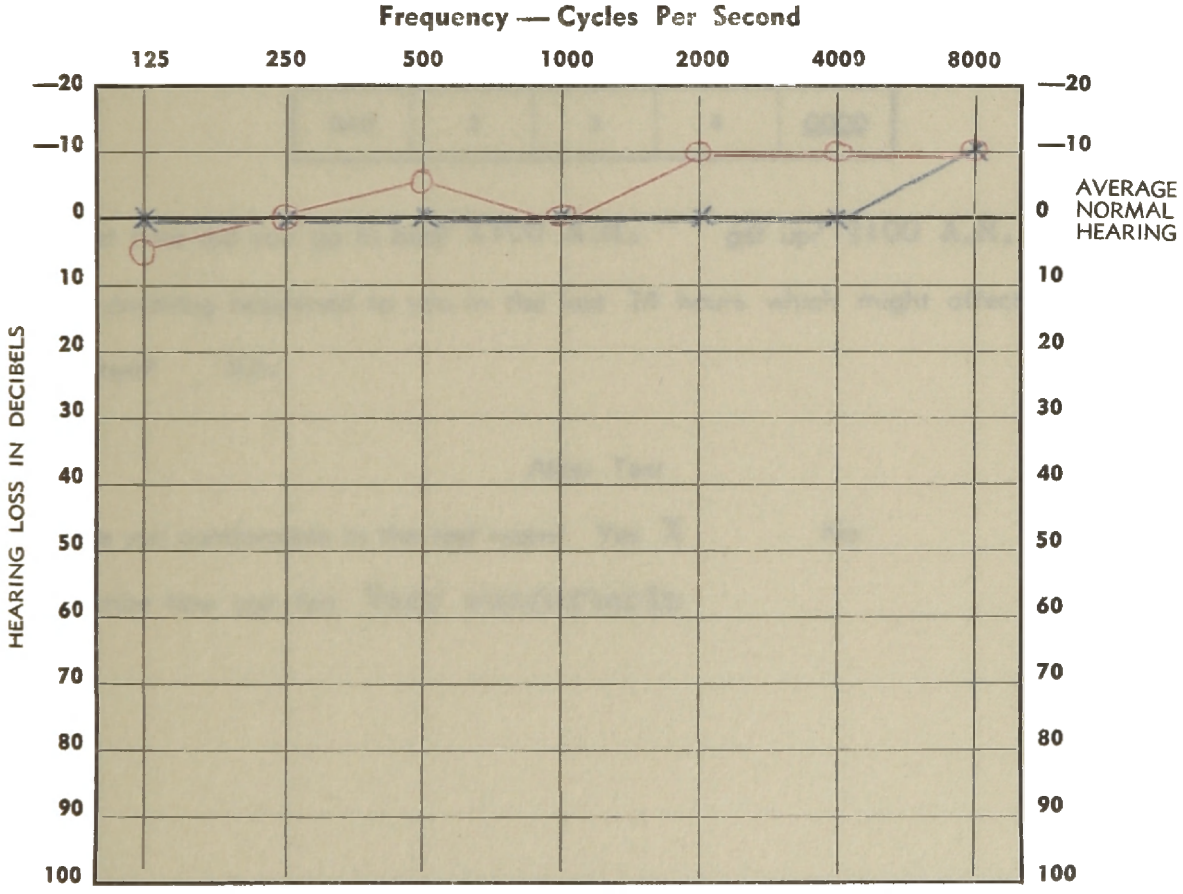
His grades were between C and B.

Audiogram 18

Date 4/7/52 Time 3:30 P.M.

Name Subject 3 Test 1

	Inside Room	Outside
Temperature	70° F.	39° F.
Relative Humidity	50%	62%
Barometric Pressure	29.35 Steady	29.17 Steady
Wind		WNW 18



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/7/52	Time	3:30 P.M.
Name	Subject 3	Test	1
	Before Test		After Test
Pulse	84		84
Temperature	98.4°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I had a good night's sleep. Today's sunshine has made me feel great.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:00 A.M. get up? 9:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very comfortable

8. Comments by operator: Signal lights: No delay. Consistent threshold at each frequency except 250 cycles, right ear. First testing period. Adjustments being made on mechanical equipment.

Questionnaire 15

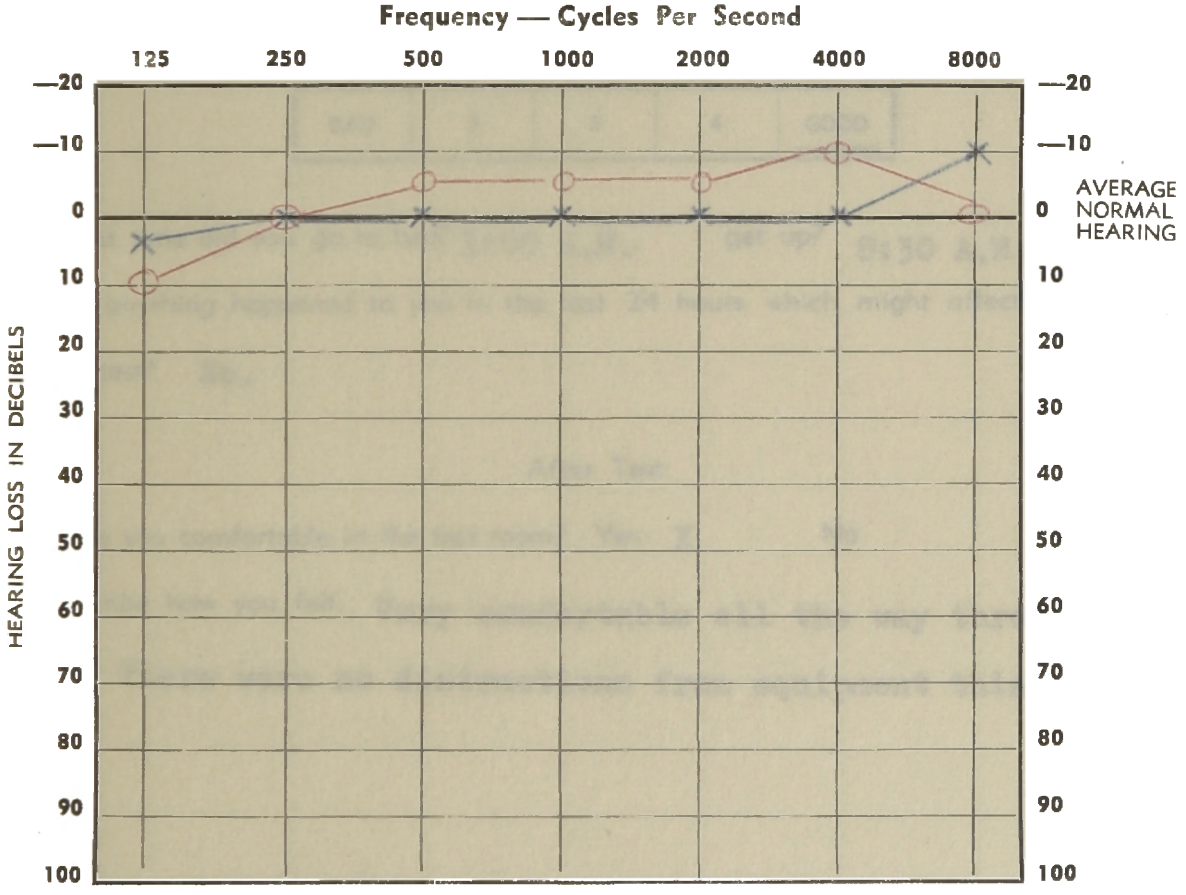
Audiogram 19

Date 4/14/52 Time 3:30 P.M.

Name Subject 3 Test 2

	Inside Room	Outside
Temperature	70° F.	37° F.
Relative Humidity	65%	91% Raining
Barometric Pressure	28.97 Steady	28.82 Steady

Wind NNW 19



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/14/52	Time	3:30 P.M.
Name	Subject 3	Test	2
	Before Test		After Test
Pulse	76		64
Temperature	97.8°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Rested and in good health.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:00 A.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very comfortable all the way through the test. There were no distractions from equipment this time.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

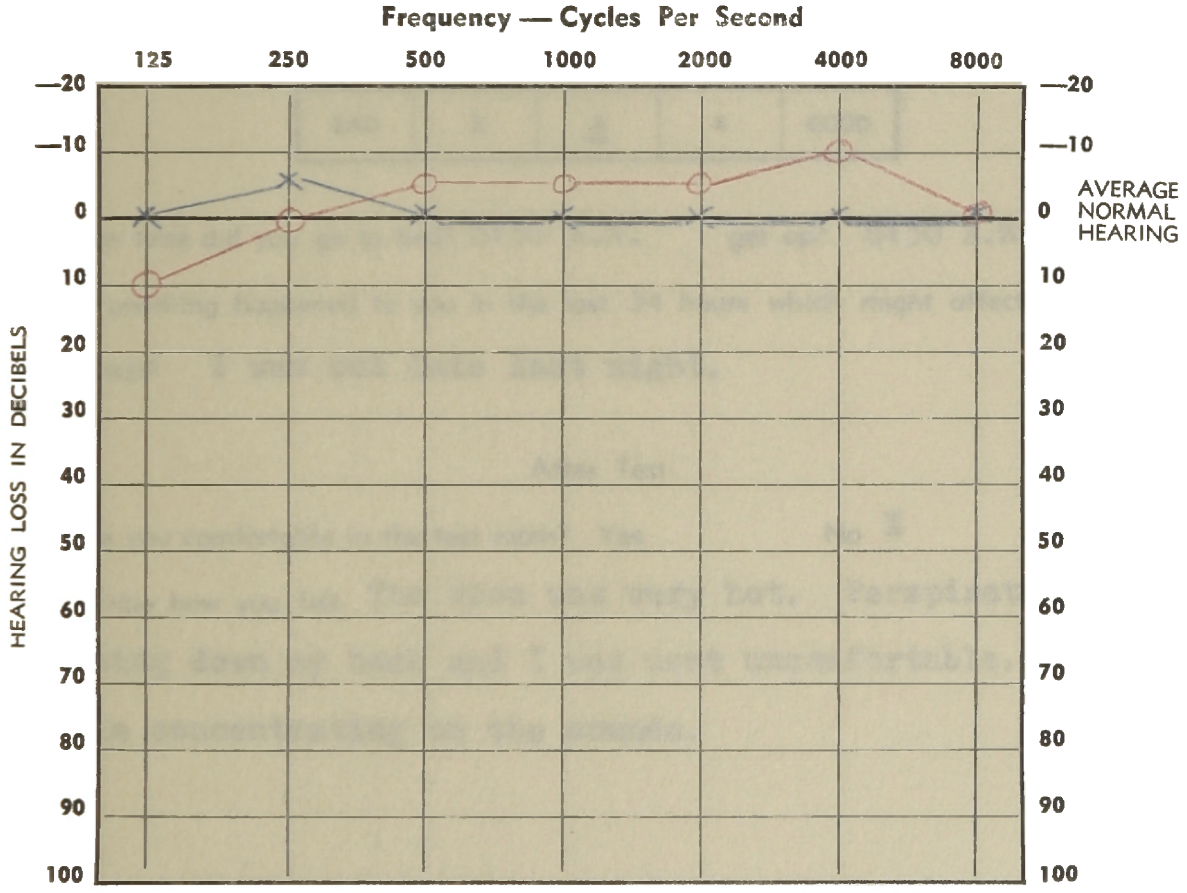
Questionnaire 16

Audiogram 20

Date 4/21/52 Time 3:30 P.M.

Name Subject 3 Test 3

	Inside Room	Outside
Temperature	90° F.	79° F.
Relative Humidity	65%	38%
Barometric Pressure	29.30 Steady	29.14 Steady
Wind		SW 14



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at - - - -

Bone Conduction — — — — —

|> Right Ear with masking at - - -

<| Left Ear with masking at . . . .

Date	4/21/52	Time	3:30 P.M.
Name	Subject 3	Test	3
	Before Test		After Test
Pulse	72		80
Temperature	98.4°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. I was tired, but I slept an hour this afternoon.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		X		

4. What time did you go to bed? 2:30 A.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? I was out late last night.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. The room was very hot. Perspiration was streaming down my back and I was very uncomfortable. I had trouble concentrating on the sounds.

8. Comments by operator: Signal lights: Uncertain flickering after interrupter had cut out the tone. Subject seemed restless during waiting period. Profuse sweating.

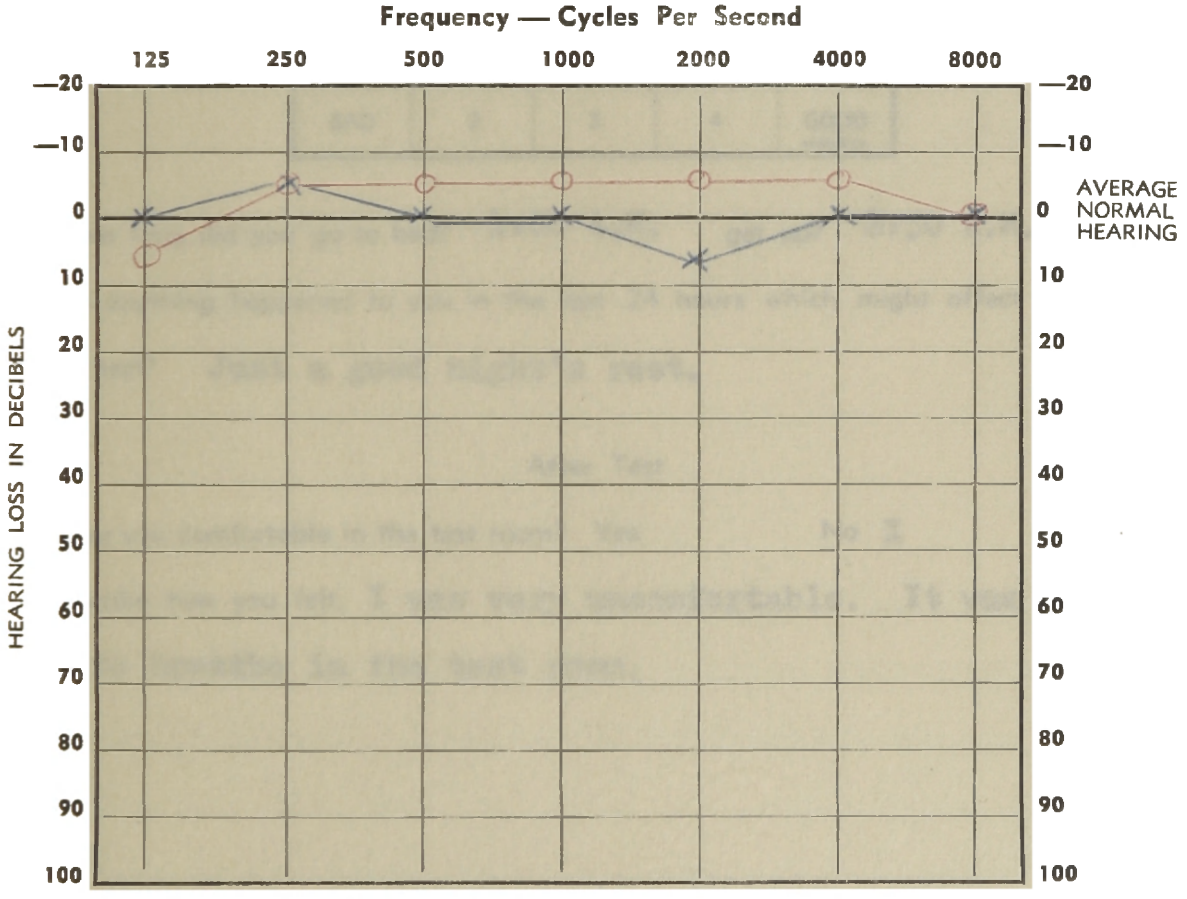
Questionnaire 17

Audiogram 21

Date 4/28/52 Time 3:30 P.M.

Name Subject 3 Test 4

	Inside Room	Outside
Temperature	90° F.	69° F.
Relative Humidity	80%	44%
Barometric Pressure	29.20 Rising	28.98 Rising
Wind	N 20	



Air Conduction - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at _____

Bone Conduction — — — — —

|> Right Ear with masking at - -

<| Left Ear with masking at . . . .

Date	4/28/52	Time	3:30 P.M.
Name	Subject 3	Test	4
	Before Test		After Test
Pulse	88		88
Temperature	98.6°		99.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I'm in a good frame of mind.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:00 A.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Just a good night's rest.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was very uncomfortable. It was difficult to breathe in the test room.

8. Comments by operator: Signal lights: 6 to 10 seconds delay. Profuse sweating after four minutes in test room. Restless movements during waiting period.

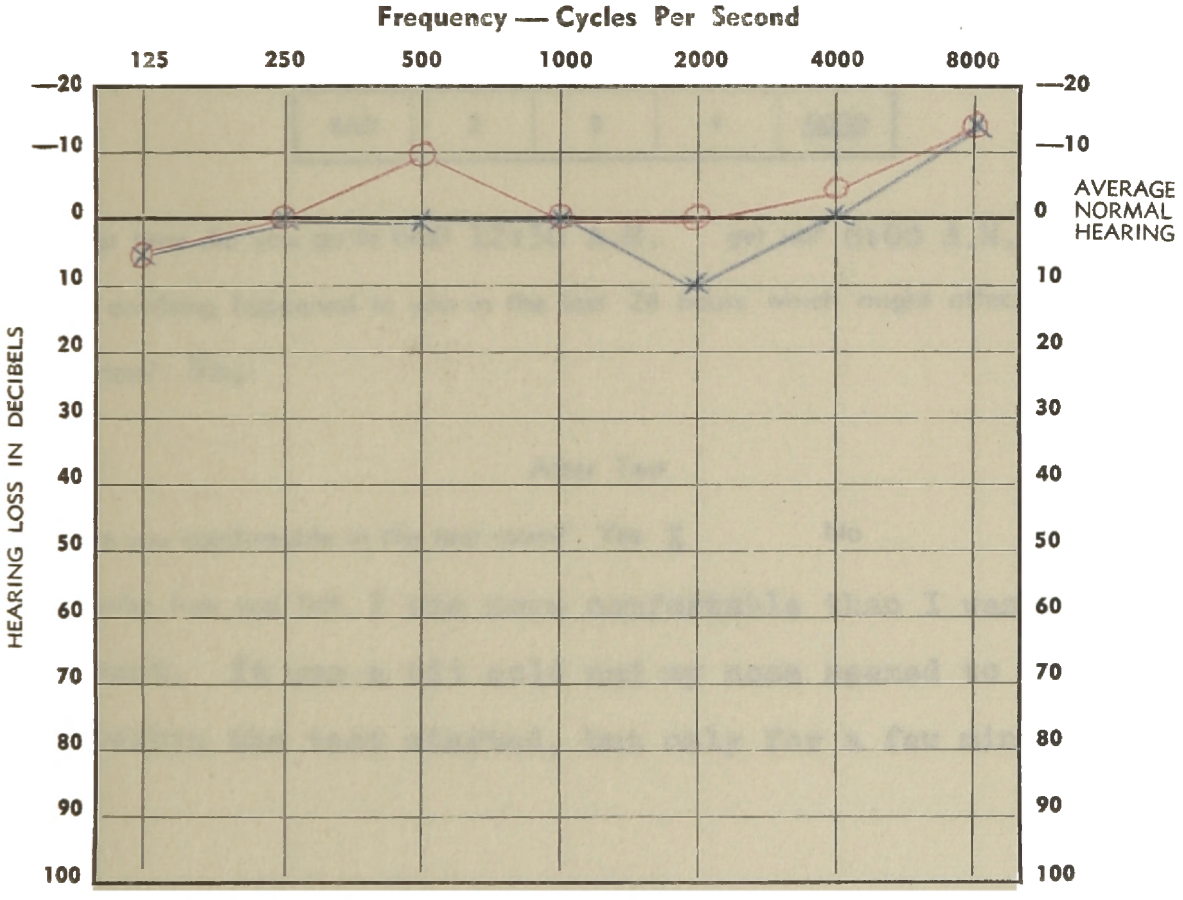
Questionnaire 18

Audiogram 22

Date 5/2/52 Time 3:00 P.M.

Name Subject 3 Test 5

	Inside Room	Outside
Temperature	50° F.	63° F.
Relative Humidity	70%	36%
Barometric Pressure	29.27 Steady	29.09 Steady
Wind		NNW 14



Air Conduction - - - - - -

O Right Ear _____

X Left Ear - - - - - -

with masking

△ Right Ear at - - - -

□ Left Ear at - - - - -

Bone Conduction — — — — —

|> Right Ear with masking at - - - -

<| Left Ear with masking at - - - -

Date	5/2/52	Time	3:00 P.M.
Name	Subject 3	Test	5
	Before Test		After Test
Pulse	88		64
Temperature	98.4°		98.0°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel wonderful.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was more comfortable than I was for the last test. It was a bit cold and my nose seemed to block up just before the test started, but only for a few minutes.

8. Comments by operator: Signal lights: No delay. Consistent threshold at each frequency. Nose running after 25 minutes in test room.

Questionnaire 19

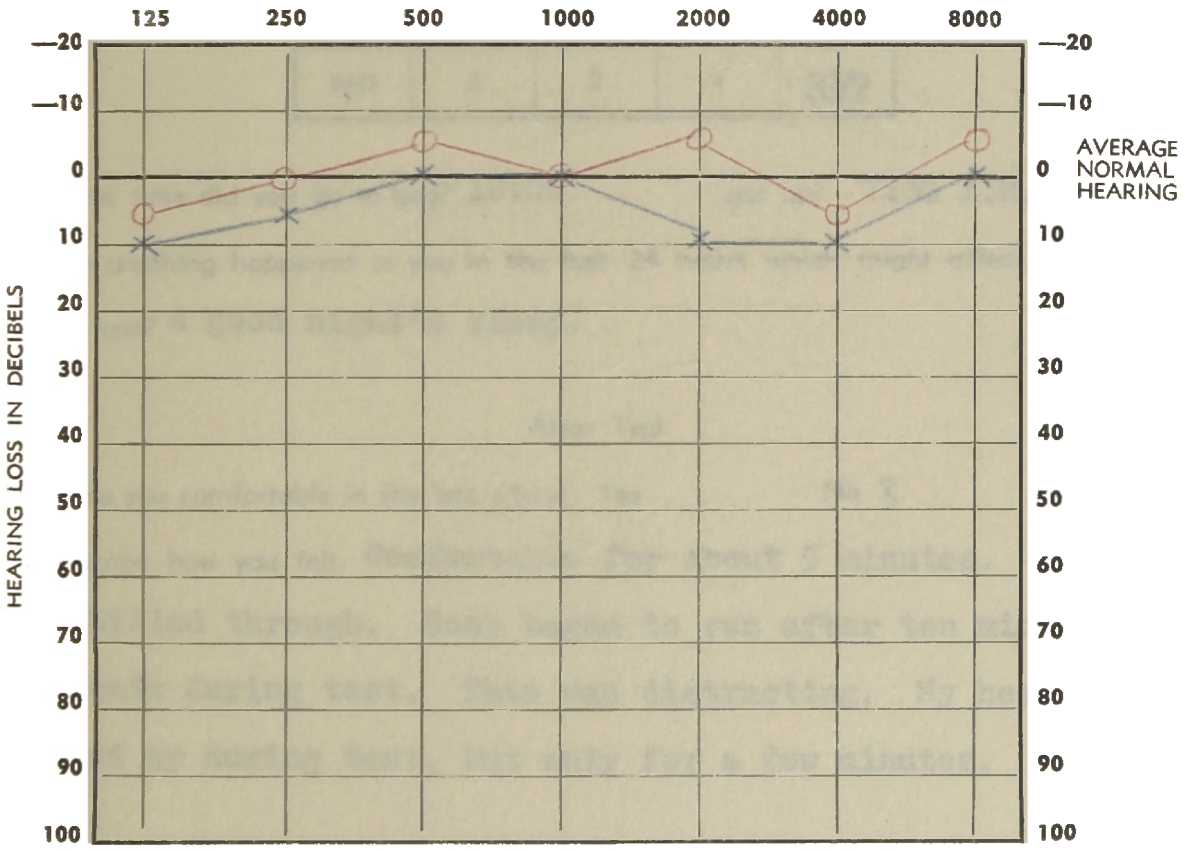
Audiogram 23

Date 5/5/52 Time 3:00 P.M.

Name Subject 3 Test 6

	Inside Room	Outside
Temperature	20° F.	84° F.
Relative Humidity	80%	36%
Barometric Pressure	28.95 Steady	28.79 Steady
		Wind WNW 21

Frequency — Cycles Per Second



Air Conduction - - - - - -

O Right Ear _____

X Left Ear - - - - - -

with masking

△ Right Ear at - - - -

□ Left Ear at - - - - -

Bone Conduction ——————

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date	5/5/52	Time	3:30 P.M.
Name	Subject 3	Test	6
	Before Test		After Test
Pulse	72		64
Temperature	98.4°		98.0°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Well rested and comfortable.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? A good night's sleep.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Comfortable for about 5 minutes. Then I was chilled through. Nose began to run after ten minutes and again during test. This was distracting. My head also blocked up during test, but only for a few minutes.

8. Comments by operator: Consistent threshold at each frequency except 2000, 4000 and 8000 cycles, left ear. Signal lights: No delay.

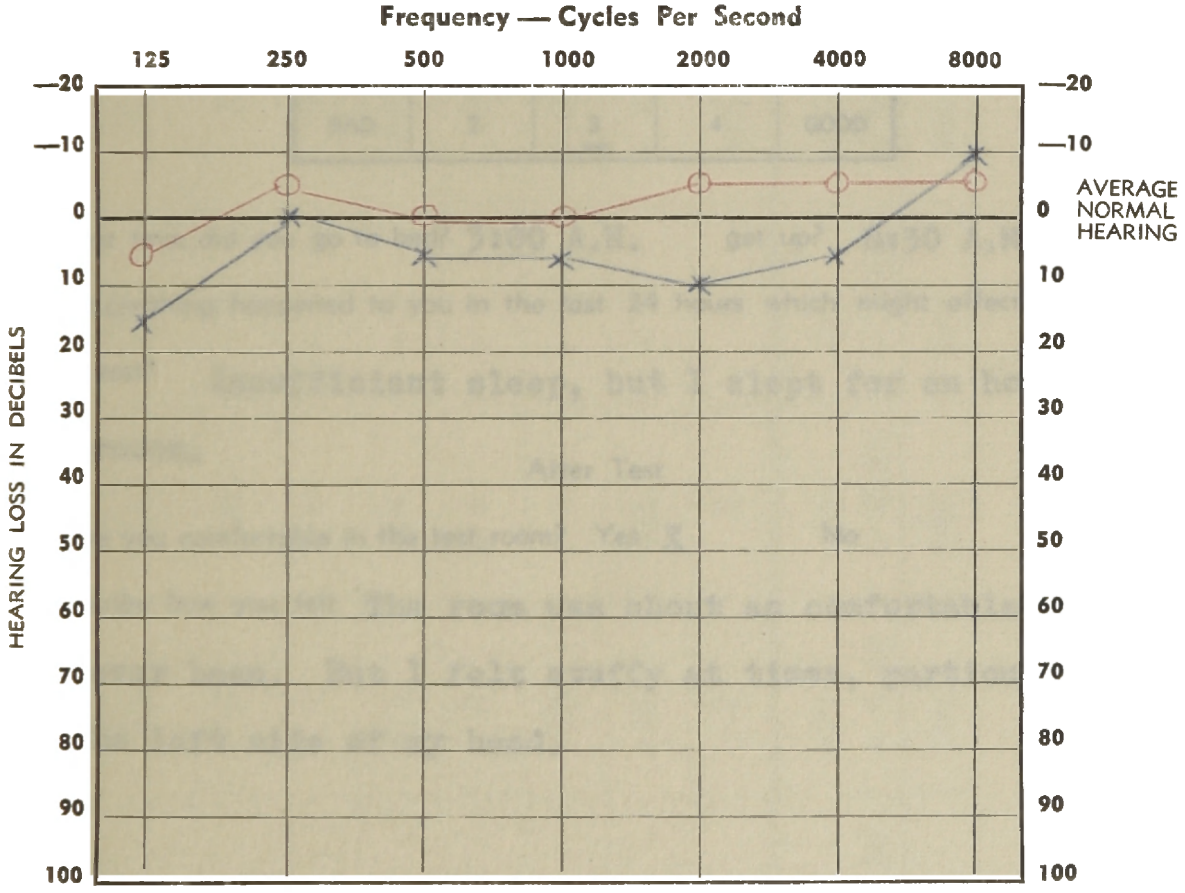
Questionnaire 20

Audiogram 24

Date 5/12/52 Time 3:00 P.M.

Name Subject 3 Test 7

	Inside Room	Outside
Temperature	70° F.	46° F.
Relative Humidity	50%	71% Raining
Barometric Pressure	28.90	28.70
Wind	W 22	



Air Conduction - - - - - -

O Right Ear .....

X Left Ear — — — —

with masking

△ Right Ear at - - - - -

□ Left Ear at — — — —

Bone Conduction — — — — —

|> Right Ear with masking at - -

<| Left Ear with masking at

Date	5/12/52	Time	3:00 P.M.
Name	Subject 3	Test	7
	Before Test		After Test
Pulse	76		68
Temperature	97.8°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel well, but I think I am getting a cold.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 3:00 A.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Insufficient sleep, but I slept for an hour this afternoon.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. The room was about as comfortable as it has ever been. But I felt stuffy at times, particularly on the left side of my head.

8. Comments by operator: Consistent threshold at each frequency except 2000 and 8000 cycles, left ear. Signal lights: Flickering after interrupter had cut out the tone.

Questionnaire 21

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	5	5	10	5	5	5	5	5
250	0	0	0	- 5	0	0	- 5	5
500	- 5	- 5	- 5	- 5	-10	- 5	0	10
1000	0	0	- 5	- 5	0	0	0	5
2000	-10	-10	- 5	- 5	0	- 5	- 5	10
4000	-10	-10	-10	- 5	- 5	5	- 5	15
8000	-10	0	0	0	-15	- 5	- 5	15
Loss in db ≶ Loss Ave. Loss	-30 - 4.28	-20 - 2.86	-15 - 2.14	-20 - 2.86	-25 - 3.57	- 5 -.72	-15 - 2.14	25 3.57
Rank	1st	3rd	5th	3rd	2nd	7th	5th	

Maximum Deviation of 25 (3.57) Decibels Subject 3

Between 70° 50% and 20° 80% Right Ear

TABLE V

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	5	0	0	5	10	15	15
250	0	0	- 5	- 5	0	5	0	10
500	0	0	0	0	0	0	5	5
1000	0	0	0	0	0	0	5	5
2000	0	0	0	5	10	10	10	10
4000	0	0	0	0	0	10	5	5
8000	-10	-10	0	0	-15	0	-10	15
Loss in db Σ Loss Ave. Loss	-10 - 1.42	- 5 -.72	- 5 -.72	0 .00	0 .00	35 5.00	30 4.28	45 6.42
Rank	1st	2nd	2nd	4th	4th	7th	6th	

Maximum Deviation of 45 (6.42) Decibels Subject 3

Between 70° 50% and 20° 80% Left Ear

TABLE VI

Subject 4

1. Medical Findings

   a. Physical Examination

      Age: 27

      Height: 69"

      Weight: 155

      Robust in appearance

      Heart and lungs: Normal

      Chest X-Ray: Negative

      Blood pressure: 120/70

      Septal deviation to left

      Tonsils present and normal

      Thyroid palpable and slightly enlarged

      Abdomen: Normal

   b. Laboratory Examination

      Urinalysis: Negative

      Red blood count: 5,270,000

      Hemoglobin: 100% 16.6 mgm. per 100 cc.

   c. Oto-rhinolaryngeal Examination

      History: Ear infection in childhood. None since. Audiogram shows normal hearing.

      Examination:

      Throat: Small cryptic tonsils and small central adenoid pad.

      Nose: Septal deviation to left. No obstruction.

Ears: Right and left tympanum negative

Advice: None

Diagnosis: Small tonsils

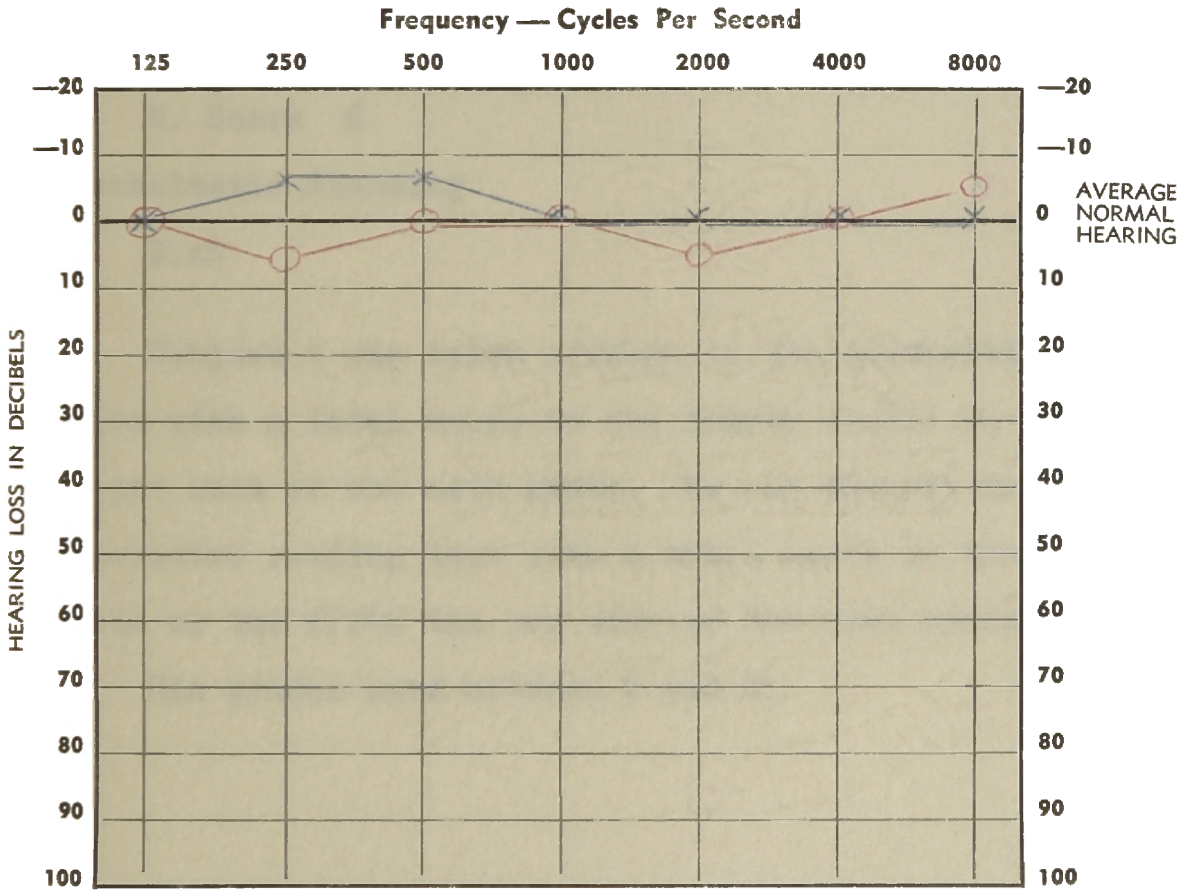
The medical findings revealed nothing pertinent to this study.

Audiogram 25

Date 11/21/51 Time 2:00 P.M.

Name Subject 4 Test Clinic

	Inside Room	Outside
Temperature		47° F.
Relative Humidity		41%
Barometric Pressure		29.19
Wind		S 23



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at ____

Bone Conduction ——————

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Subject 4

2. Test Scores

Psychological Examination

Q. Score 4

L. Score 5

T. Score 4

Cooperative Test of Reading Comprehension

V. Score 6

R. Score 6

C. Score 6

T. Score 6

3. Scholastic Standing

2.48

Subject 4 was below average on the psychological examination with a total score in the fourth decile or the seventh ten per cent of the norm group. He was average on the cooperative reading test with a total score in the sixth decile or the fifth ten per cent of the norm group.

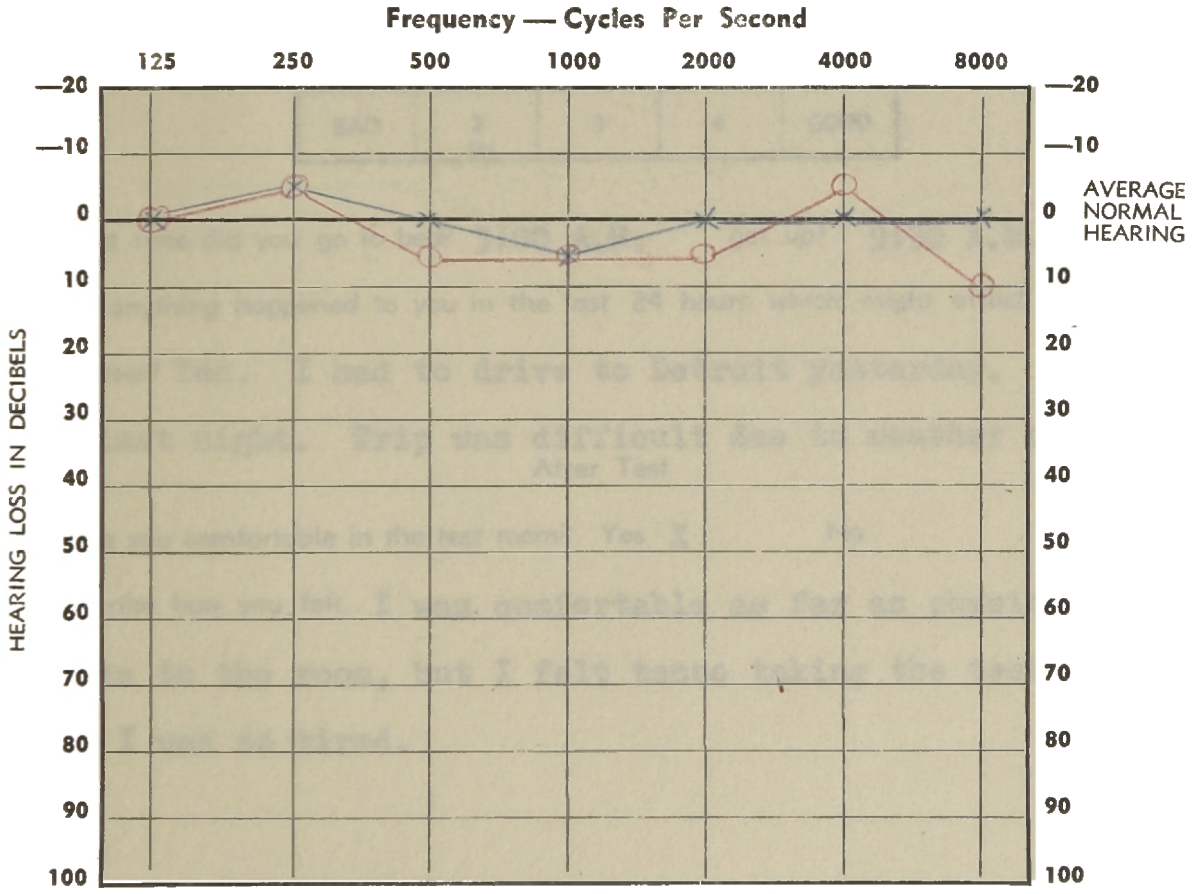
His grades were between C and B.

Audiogram 26

Date 4/7/52 Time 2:30 P.M.

Name Subject 4 Test 1

	Inside Room	Outside
Temperature	70° F.	40° F.
Relative Humidity	50%	62%
Barometric Pressure	29.35 Steady	29.17 Steady
		Wind WNW 18



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/7/52	Time	2:30 P.M.
Name	Subject 4	Test	1
	Before Test		After Test
Pulse	76		74
Temperature	98.4°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I have an over all feeling of depression.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 3:00 A.M. get up? 9:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Yes. I had to drive to Detroit yesterday. Got back late last night. Trip was difficult due to weather conditions.
After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was comfortable as far as physical conditions in the room, but I felt tense taking the test because I was so tired.

8. Comments by operator: Consistent threshold at each frequency. Slept during waiting period.

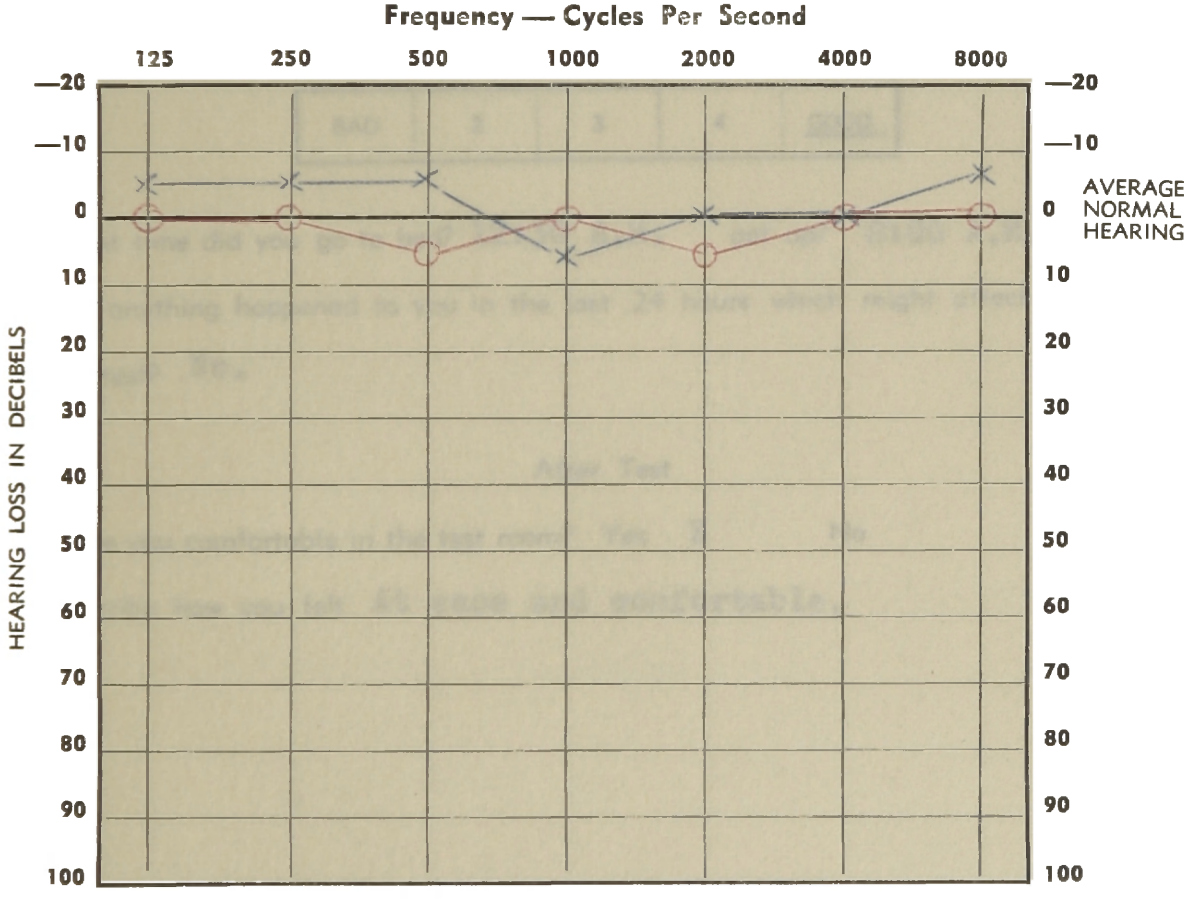
Questionnaire 22

Audiogram 27

Date 4/14/52 Time 2:30 P.M.

Name Subject 4 Test 2

	Inside Room	Outside
Temperature	70° F.	37° F.
Relative Humidity	65%	91% Raining
Barometric Pressure	28.97 Steady	28.82 Steady
Wind		NNW 19



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at _____

Bone Conduction ——————

|> Right Ear with masking at ——

<| Left Ear with masking at ...

Date	4/14/52	Time	2:30 P.M.
Name	Subject 4	Test	2
	Before Test		After Test
Pulse	76		74
Temperature	97.2°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Normal amount of tension for me. Otherwise I have a feeling of well being.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. At ease and comfortable.

8. Comments by operator: Consistent threshold at each frequency. Subject seemed more relaxed and alert than on last test.

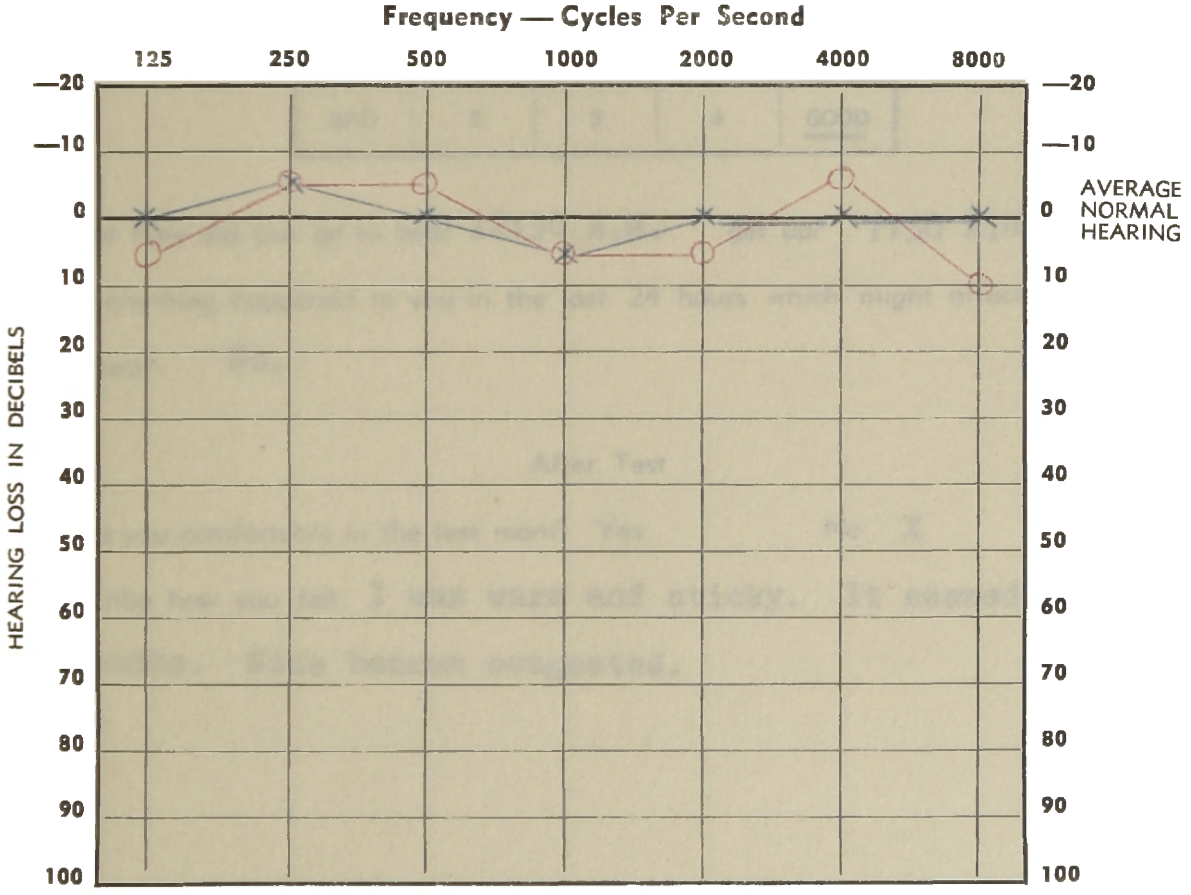
Questionnaire 23

Audiogram 28

Date 4/18/52 Time 2:30 P.M.

Name Subject 4 Test 3

	Inside Room	Outside
Temperature	90° F.	70° F
Relative Humidity	65%	40%
Barometric Pressure	29.35 Falling	29.19 Falling
Wind		W 15



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at - - - -

Bone Conduction — — — — —

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date 6/18/52 Time 2:30 P.M.

Name Subject 4 Test 3

	Before Test	After Test
Pulse	84	90
Temperature	97.8°	98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Completely relaxed. Probably Spring Fever!

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was warm and sticky. It seemed hard to breathe. Nose became congested.

8. Comments by operator: Mouth breathing after 10 minutes in test room. Profuse sweating. Consistent threshold at each frequency. Signal lights: 3 to 5 seconds delay.

Questionnaire 24

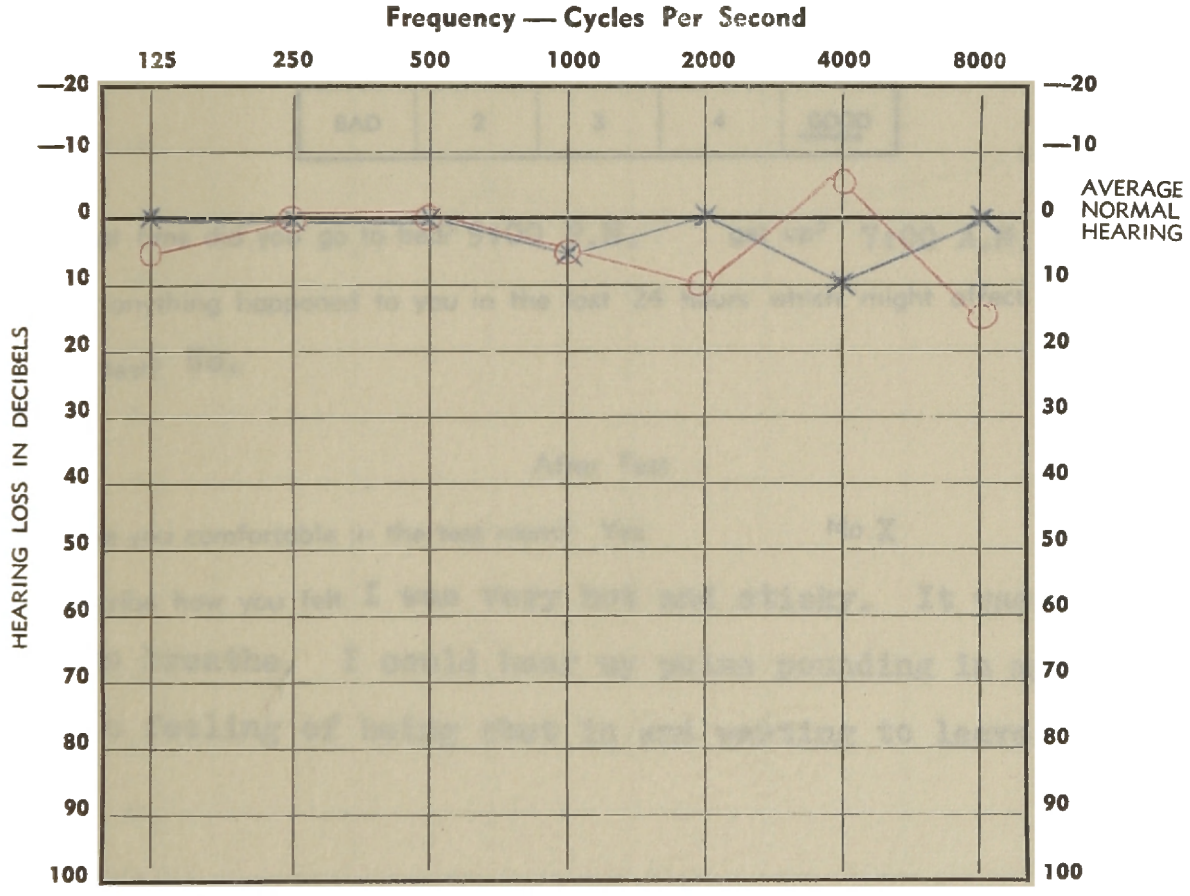
Audiogram 29

Date 4/28/52 Time 2:30 P.M.

Name Subject 4 Test 4

	Inside Room	Outside
Temperature	90° F.	68° F.
Relative Humidity	80%	44%
Barometric Pressure	29.20 Rising	28.98 Rising

Wind N 20



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/28/52	Time	2:30 P.M.
Name	Subject 4	Test	4
	Before Test		After Test
Pulse	72		96
Temperature	97.8°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. Just my usual amount of tension over money matters, my family and my ability to earn a living.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
				X

4. What time did you go to bed? 9:00 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was very hot and sticky. It was difficult to breathe. I could hear my pulse pounding in my ears. I had a feeling of being shut in and wanting to leave.

8. Comments by operator: Profuse sweating after 5 minutes. Mouth breathing after 10 minutes. Inconsistent threshold at 125, 250, 4000 and 8000 cycles, both ears.

Questionnaire 25

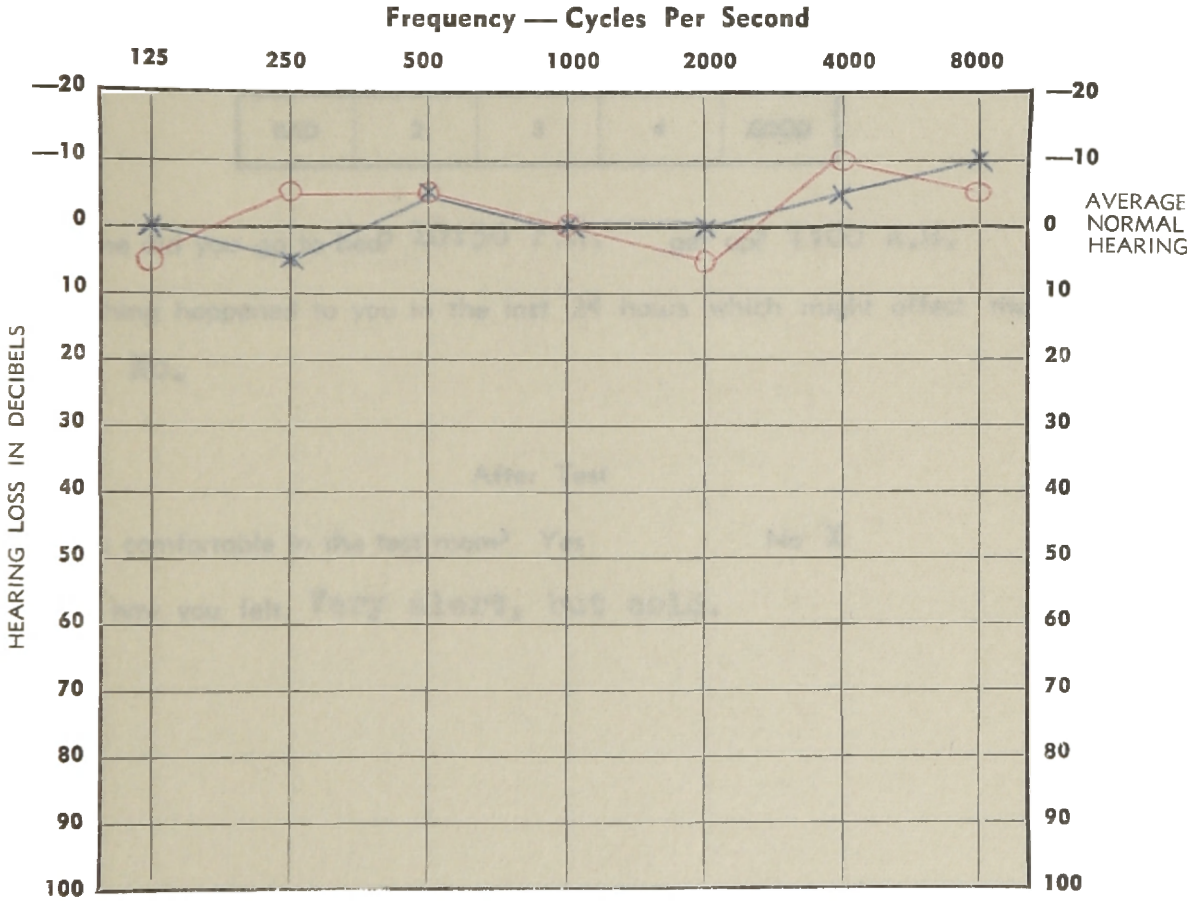
Audiogram 30

Date 5/2/52 Time 4:00 P.M.

Name Subject 4 Test 5

	Inside Room	Outside
Temperature	50° F.	64° F.
Relative Humidity	70%	36%
Barometric Pressure	29.27 Steady	29.07 Steady

Wind NNW 14



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at _____

Bone Conduction _____

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/2/52	Time	4:00 P.M.
Name	Subject 4	Test	5

	Before Test	After Test
Pulse	78	66
Temperature	97.8°	98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Just a little anxious.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Very alert, but cold.

8. Comments by operator: Consistent threshold at each frequency.

Signal lights: No delay.

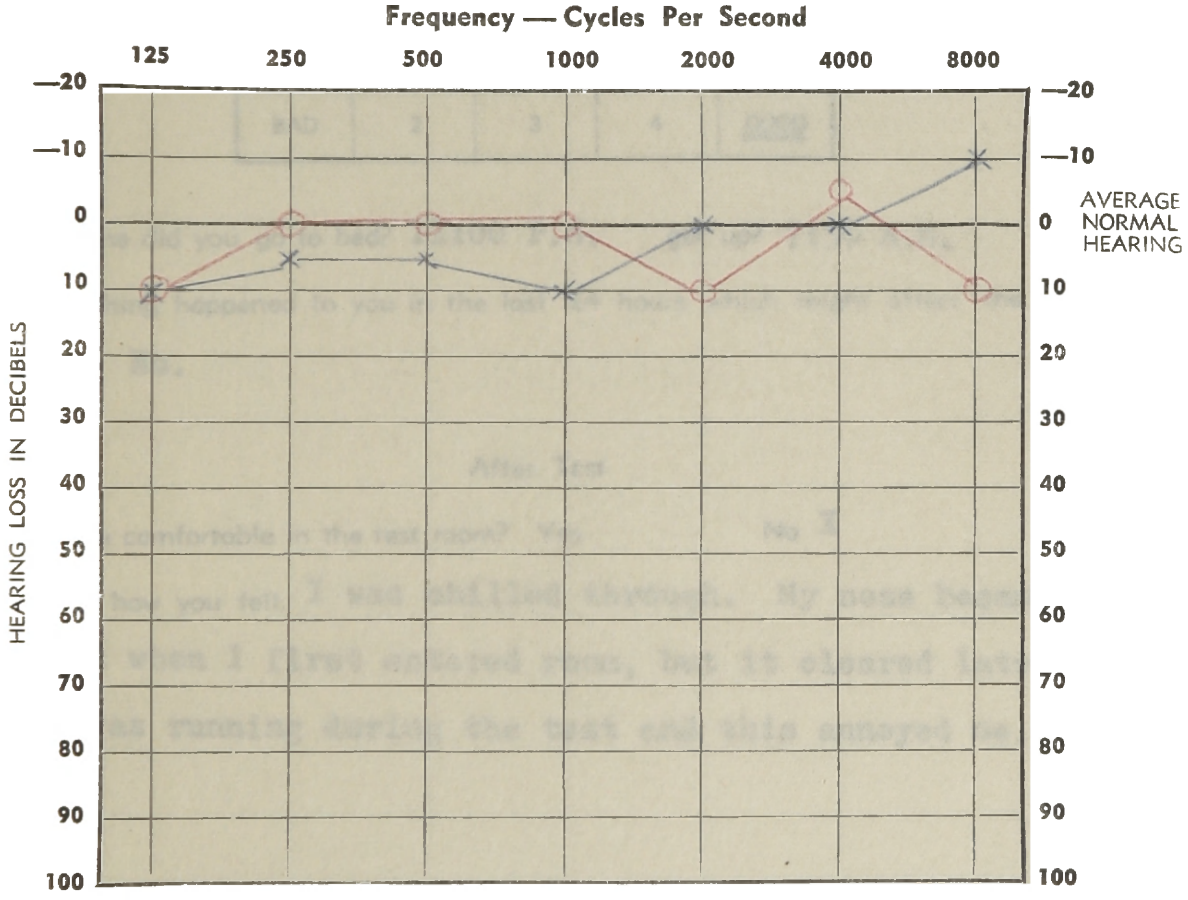
Questionnaire 26

Audiogram 31

Date 5/5/52 Time 4:00 P.M.

Name Subject 4 Test 6

	Inside Room	Outside
Temperature	20° F.	85° F.
Relative Humidity	80%	36%
Barometric Pressure	28.95 Steady	28.80 Steady
Wind		NNW 21



Air Conduction - - - - - -

O Right Ear _____

X Left Ear .....

with masking

△ Right Ear at - - - - -

□ Left Ear at — — — —

Bone Conduction ——————

|> Right Ear with masking at - -

<| Left Ear with masking at - - - -

Date	5/5/52	Time	4:00 P.M.
Name	Subject 4	Test	6
	Before Test		After Test
Pulse	92		66
Temperature	98.2°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Relieved, for I've just handed in my last term paper. Elated -- I have a graduation gift from my folks.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was chilled through. My nose became congested when I first entered room, but it cleared later. My nose was running during the test and this annoyed me.

8. Comments by operator: Mouth breathing after 5 minutes. Ears pink: ten minutes. Held up test to use handkerchief. Signal lights: Flickering after tone was off. Inconsistent threshold at 4000 and 8000 cycles, right ear.

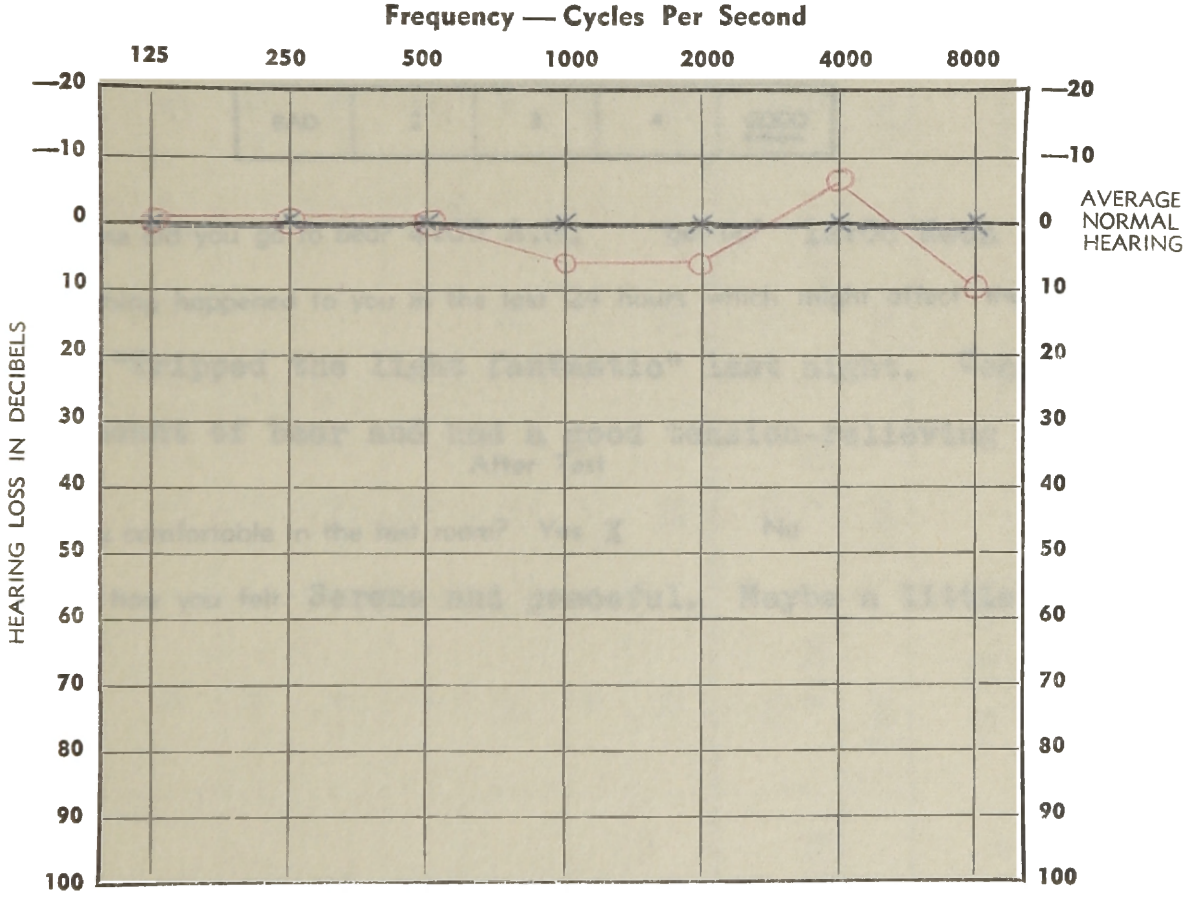
Questionnaire 27

Audiogram 32

Date 5/12/52 Time 4:00 P.M.

Name Subject 4 Test 7

	Inside Room	Outside
Temperature	70° F.	50° F.
Relative Humidity	50%	71% Raining
Barometric Pressure	28.90 Steady	28.70 Steady
		Wind W 20



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at _____

Bone Conduction ———————

|> Right Ear with masking at - - -

<| Left Ear with masking at - - - -

Date	5/12/52	Time	4:00 P.M.
Name	Subject 4	Test	7
	Before Test		After Test
Pulse	90		78
Temperature	98.2°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very serene. At peace with the world.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 4:00 A.M. get up? 12:00 Noon

5. Has anything happened to you in the last 24 hours which might affect the results of the test? "Tripped the light fantastic" last night. Consumed a goodly amount of beer and had a good tension-relieving time.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Serene and peaceful. Maybe a little sleepy.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Questionnaire 28

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	0	5	5	5	10	0	10
250	- 5	0	- 5	0	- 5	0	0	5
500	5	5	- 5	0	- 5	0	0	10
1000	5	0	5	5	0	0	5	5
2000	5	10	5	10	5	10	5	5
4000	- 5	0	- 5	- 5	-10	0 5	0 5	10
8000	10	0	10	15	- 5	10	10	20
Loss in db ≤ Loss Ave. Loss	15 2.14	15 2.14	10 1.42	30 4.28	-15 - 2.14	25 3.57	15 2.14	45 6.42
Rank	3rd	3rd	2nd	7th	1st	6th	3rd	

Maximum Deviation of 45 (6.42) Decibels

Between 50° 70% and 90° 80%

Subject 4

Right Ear

TABLE VII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	- 5	0	0	0	10	0	15
250	- 5	- 5	- 5	0	5	5	0	10
500	0	- 5	0	0	- 5	5	0	10
1000	5	5	5	5	0	10	0	10
2000	0	0	0	0	0	0	0	0
4000	0	0	0	10	- 5	0	0	15
8000	0	- 5	0	0	-10	-10	0	10
Loss in db ≤ Loss Ave. Loss	0 .00	-15 - 2.14	0 .00	15 2.14	-15 - 2.14	20 2.86	0 .00	35 5.00
Rank	3rd	1st	3rd	6th	1st	7th	3rd	

Maximum Deviation of 35 (5.00) Decibels

Between (50° 70%
(70° 65% and 20° 80%

Subject 4

Left Ear

TABLE VIII

Subject 5

1. Medical Findings

   a. Physical Examination

      Age: 20

      Height: 68"

      Weight: 145

      Heart and lungs: Normal

      Blood pressure: 120/70

      Extremities: Normal

      Moderately septic tonsils

   b. Laboratory Examination

      Urinalysis: Negative

      Red blood count: 5,160,000

      Hemoglobin: 100%

      White blood count: 6000

   c. Oto-rhinolaryngeal Examination

      History: No ear trouble

      Examination:

         Mouth: Good occlusion

         Throat: Moderately septic tonsils

         Nasopharynx: Negative. Very little adenoid tissue. Ostia clear.

         Nose: Acute rhinitis. No obstruction.

         Ears: Tympanum right and left negative

               Audiogram: Normal

Advice: No treatment

Diagnosis: Moderately infected tonsils

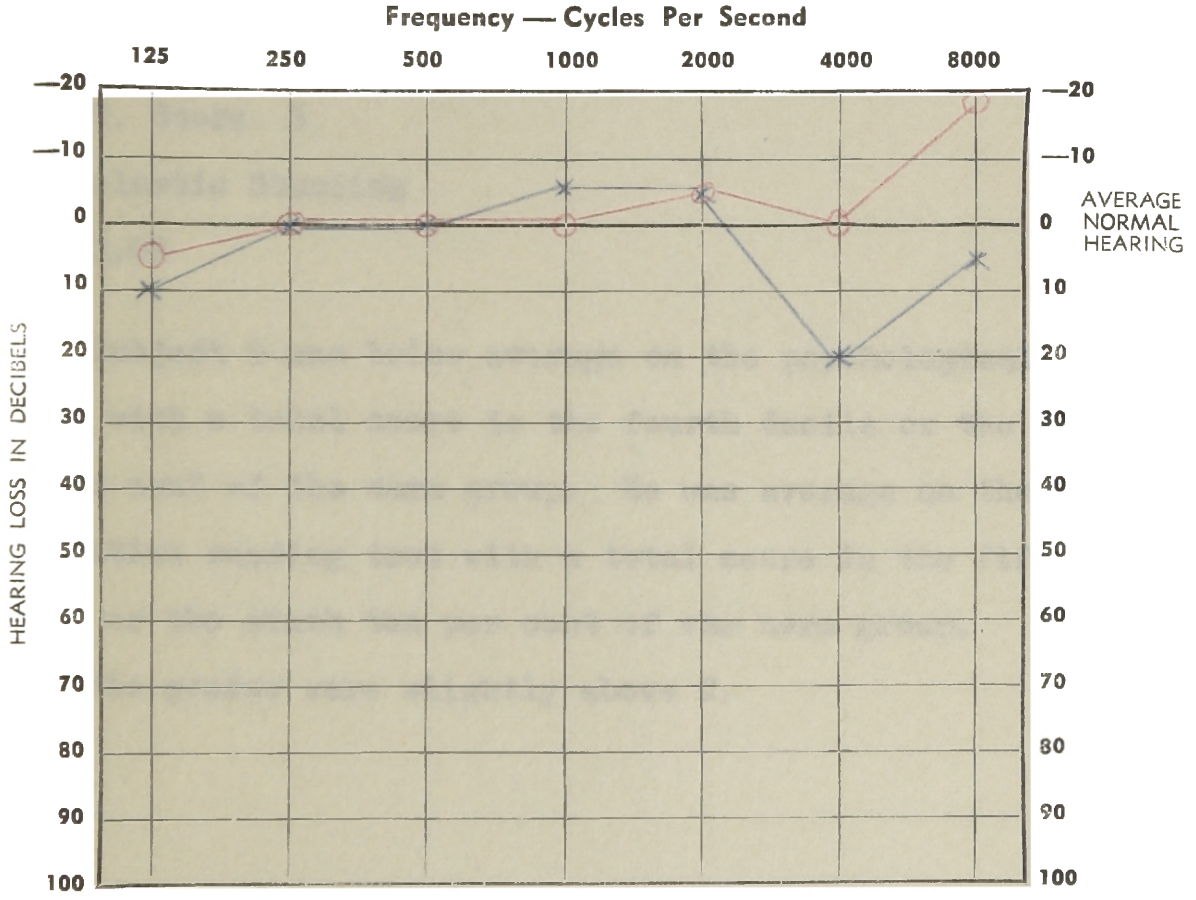
The medical findings, with the exception of acute rhinitis and moderately infected tonsils, were negative or within normal limits.

Audiogram 33

Date 11/2/51 Time 3:30 P.M.

Name Subject 5 Test Clinic

	Inside Room	Outside
Temperature		25° F.
Relative Humidity		56%
Barometric Pressure		29.19 Falling
		Wind WNW 19



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

[Right Ear with masking at

] Left Ear with masking at

Subject 5

2. Test Scores

Psychological Examination

Q. Score 1

L. Score 7

T Score 4

Cooperative Test of Reading Comprehension

V. Score 9

R. Score 3

C. Score 2

T. Score 5

3. Scholastic Standing

2.08

Subject 5 was below average on the psychological examination with a total score in the fourth decile or the seventh ten per cent of the norm group. He was average on the cooperative reading test with a total score in the fifth decile or the sixth ten per cent of the norm group.

His grades were slightly above C.

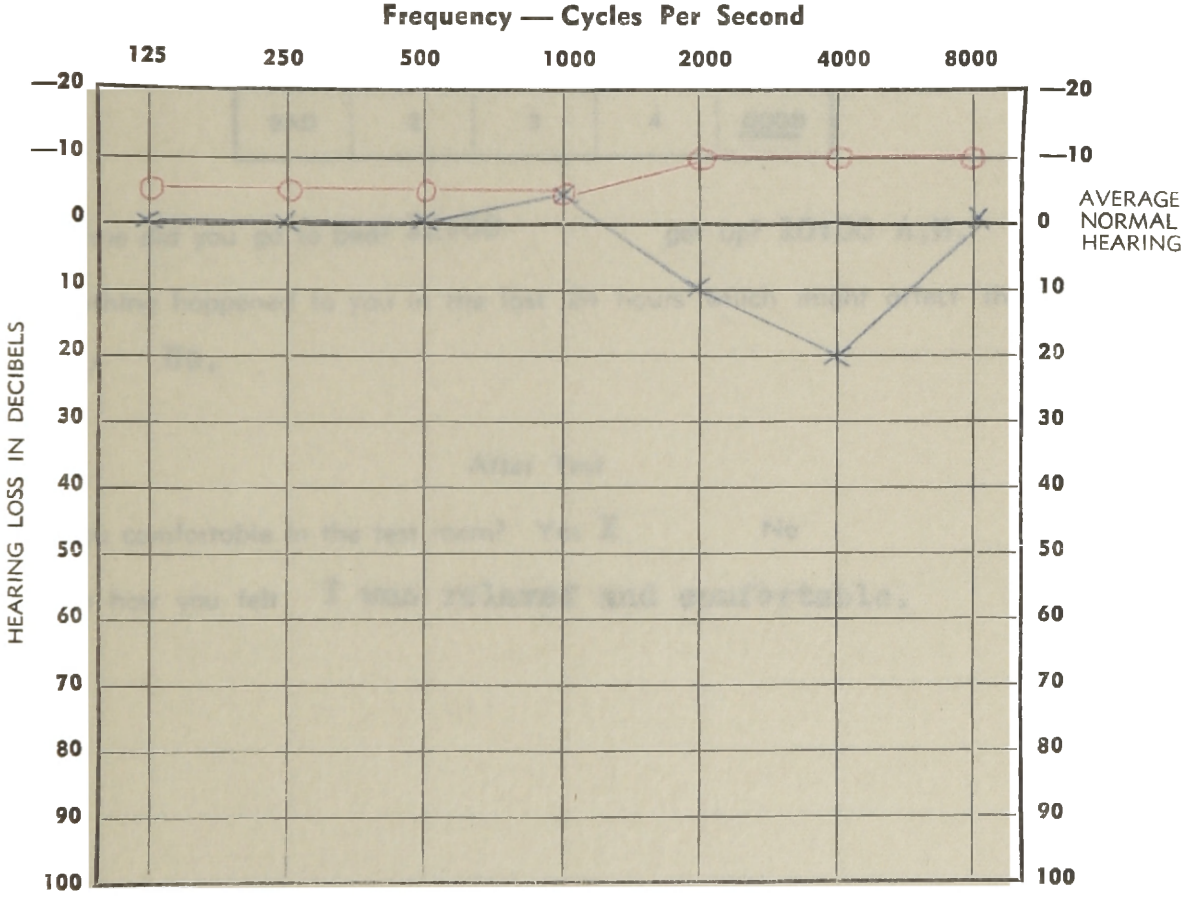
Audiogram 34

Date 4/8/52 Time 1:00 P.M.

Name Subject 5 Test 1

	Inside Room	Outside
Temperature	70° F.	48° F.
Relative Humidity	50%	58%
Barometric Pressure	29.50 Steady	29.33

Wind E 8



Air Conduction - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at - - - -

Bone Conduction ————————

|> Right Ear with masking at - - -

<| Left Ear with masking at - - - -

Date	4/8/52	Time	1:00 P.M.
Name	Subject 5	Test	1
	Before Test		After Test
Pulse	60		64
Temperature	97.6°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I felt very rested today.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 10:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was relaxed and comfortable.

8. Comments by operator: Consistent threshold at each frequency.

Signal lights: No delay.

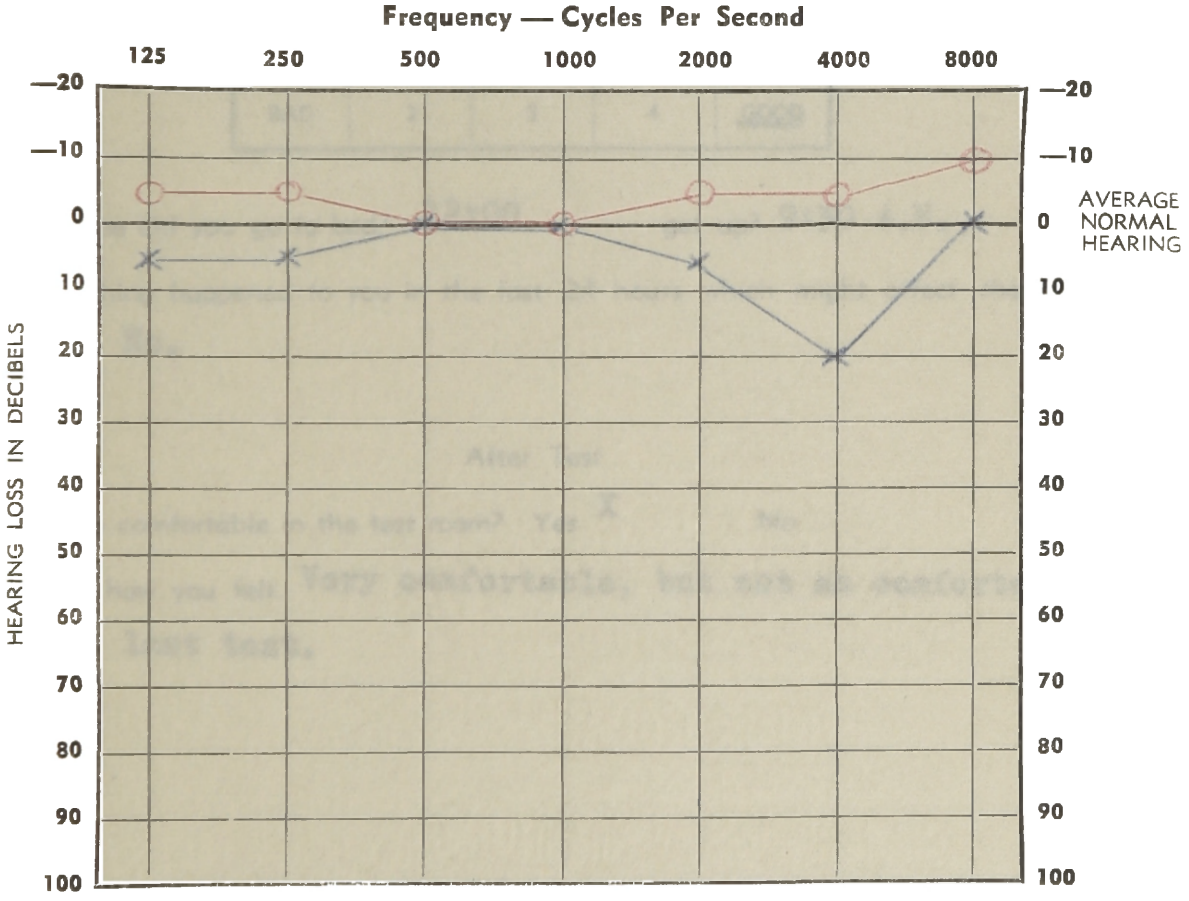
Questionnaire 29

Audiogram 35

Date 4/15/52 Time 1:00 P.M.

Name Subject 5 Test 2

	Inside Room	Outside
Temperature	70° F.	51° F.
Relative Humidity	65%	42% Light rain in A.M.
Barometric Pressure	29.25 Rising	29.12 Rising
		Wind N 30



Air Conduction - - - - - -

O Right Ear _____

X Left Ear - - - - - -

with masking

△ Right Ear at - - - - -

□ Left Ear at - - - - - -

Bone Conduction ———————

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/15/52	Time	1:00 P.M.
Name	Subject 5	Test	2
	Before Test		After Test
Pulse	72		72
Temperature	97.8°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I have no particular worries today.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 9:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very comfortable, but not as comfortable as on the last test.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

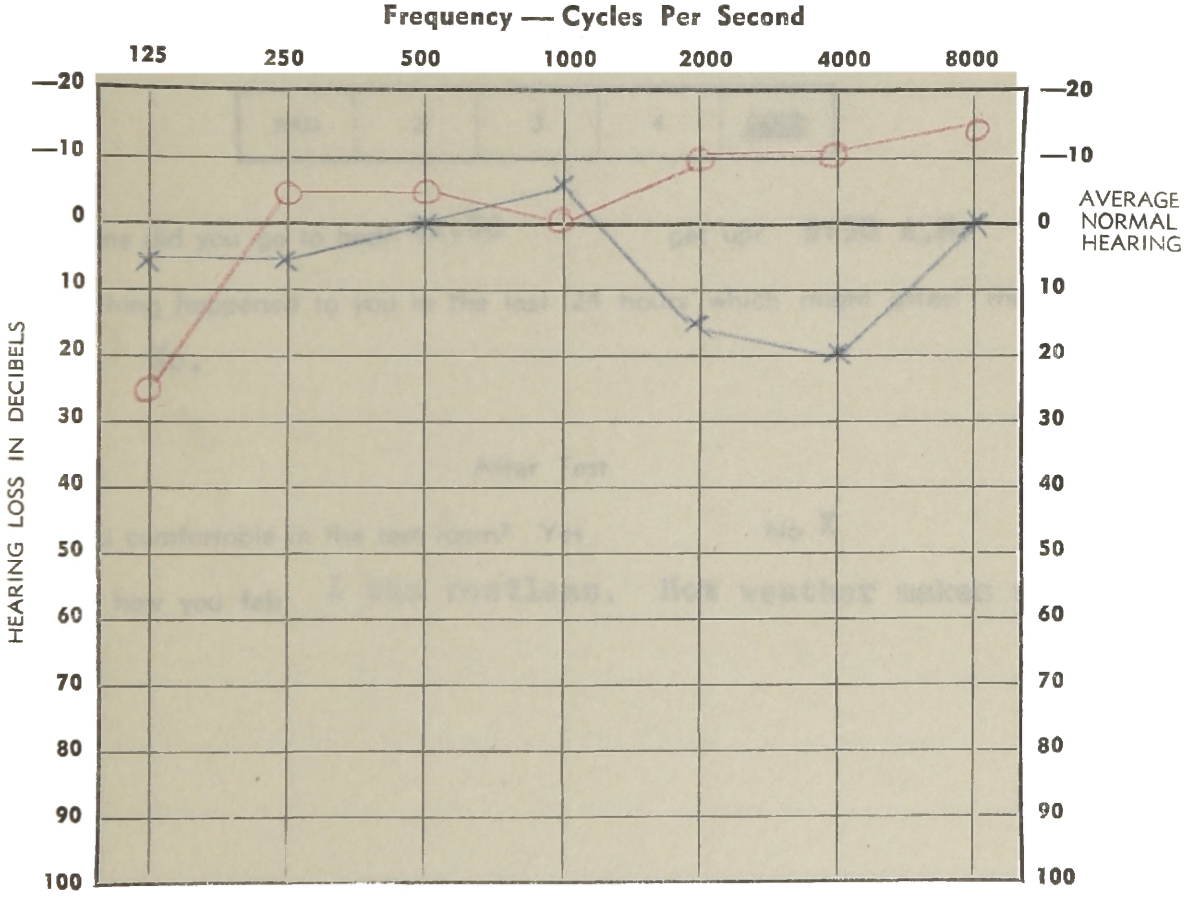
Questionnaire 30

Audiogram 36

Date 4/22/52 Time 1:00 P.M.

Name Subject 5 Test 3

	Inside Room	Outside
Temperature	90° F.	67° F.
Relative Humidity	65%	79% Raining
Barometric Pressure	29.21 Steady	29.03
Wind	SSW 15	



Air Conduction - - - - - -

O Right Ear - - - -

X Left Ear ——

with masking

△ Right Ear at - - -

□ Left Ear at - - ——

Bone Conduction ——————

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date	4/22/52	Time	1:00 P.M.
Name	Subject 5	Test	3
	Before Test		After Test
Pulse	68		74
Temperature	97.6°		99.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I may be catching cold. I am rested, but my head feels stuffed up like it does when it rains.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 9:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was restless. Hot weather makes me angry.

8. Comments by operator: Consistent threshold at each frequency except 1000 cycles, left ear. Signal lights: 5 to 8 seconds delay. Profuse sweating. Restless during waiting period.

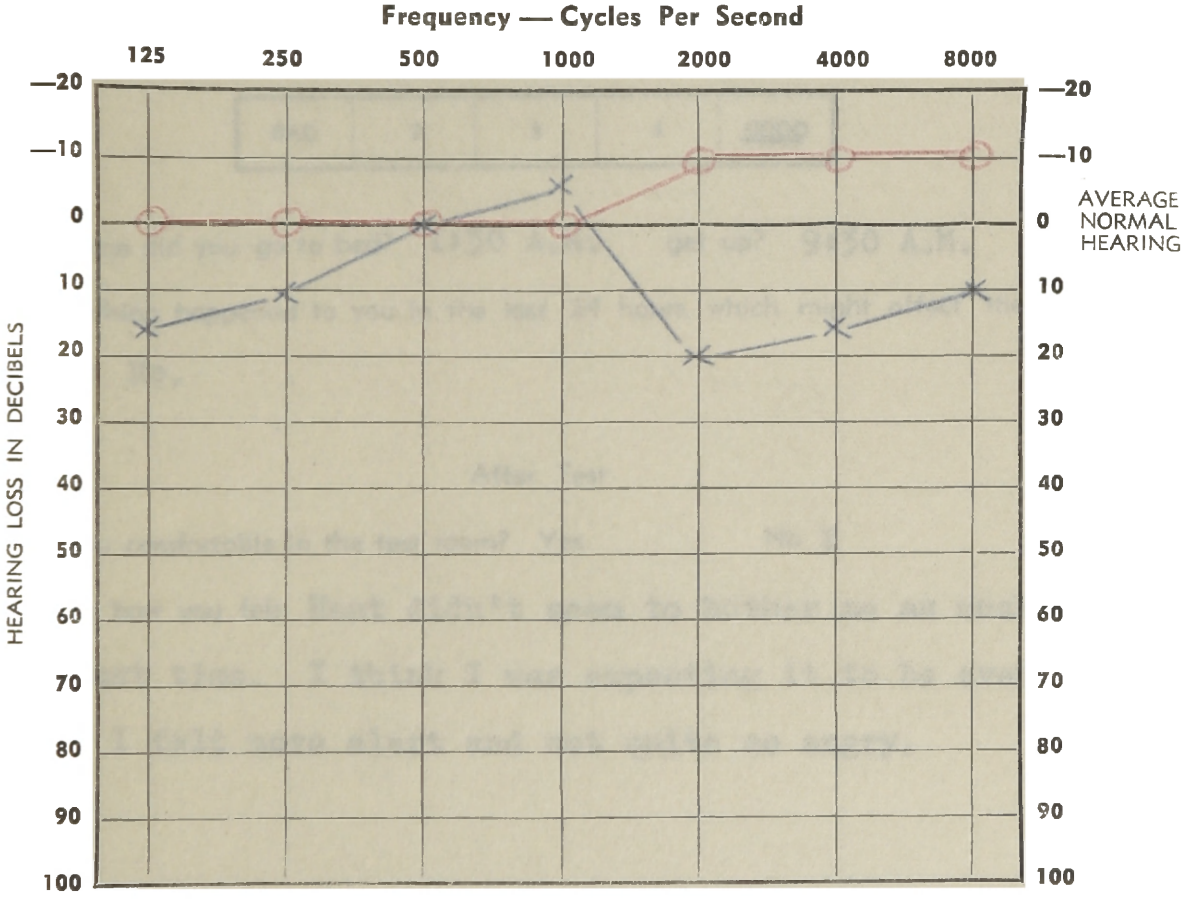
Questionnaire 31

Audiogram 37

Date 4/29/52 Time 1:00 P.M.

Name Subject 5 Test 4

	Inside Room	Outside
Temperature	90° F.	75° F.
Relative Humidity	80%	37%
Barometric Pressure	29.26 Steady	29.08
Wind		NNE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/29/52	Time	1:00 P.M.
Name	Subject 5	Test	4
	Before Test		After Test
Pulse	80		80
Temperature	97.2°		99°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Feel fine. Slept well.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:30 A.M. get up? 9:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Heat didn't seem to bother me as much as it did last time. I think I was expecting it to be even hotter. I felt more alert and not quite so angry.

8. Comments by operator: Inconsistent threshold at 2000 and 4000 cycles, left ear. Signal lights: 5 to 12 seconds delay.

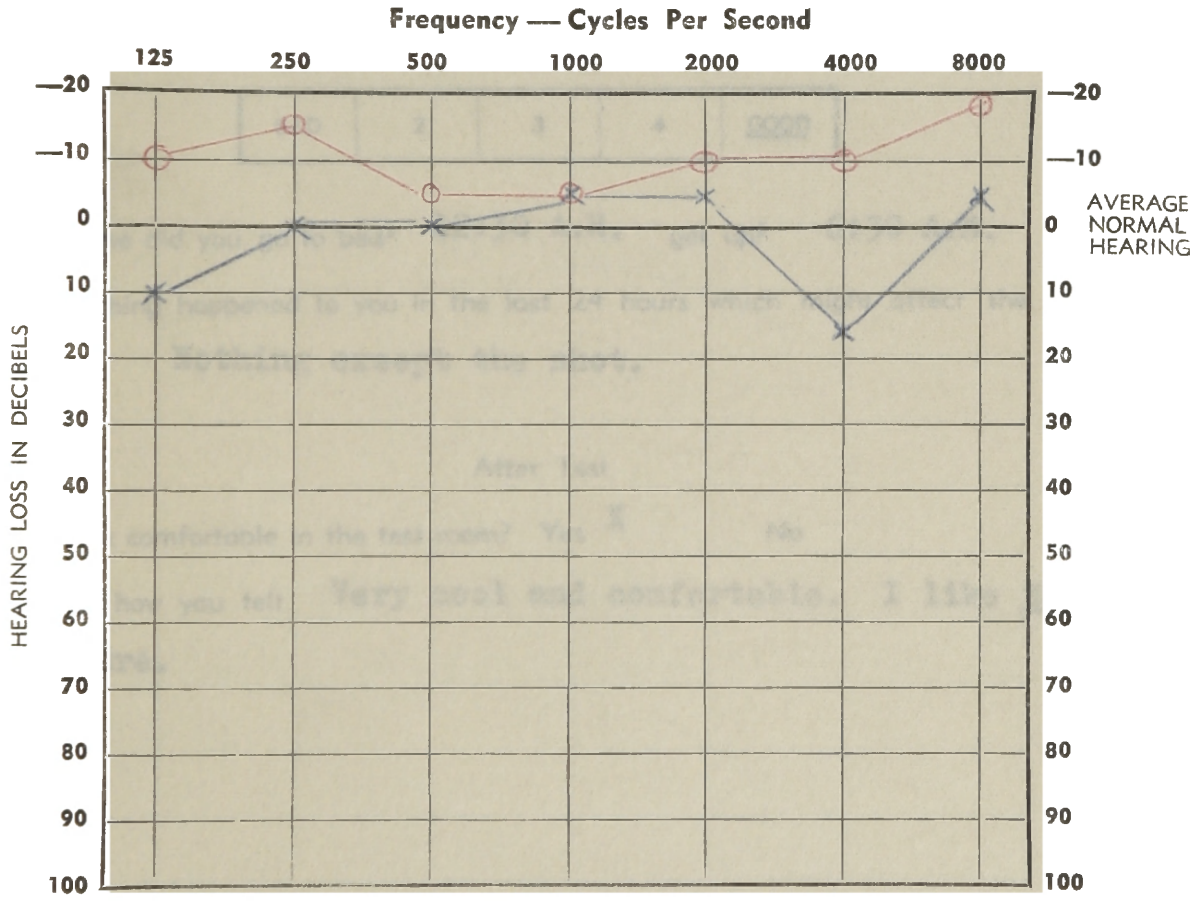
Questionnaire 32

Audiogram 38

Date 5/1/52 Time 1:00 P.M.

Name Subject 5 Test 5

	Inside Room	Outside
Temperature	50° F.	81° F.
Relative Humidity	70%	35%
Barometric Pressure	29.07 Falling	28.96 Falling
Wind		WSW 11



Air Conduction - - - - -

O Right Ear ——

X Left Ear - - - - -

with masking

△ Right Ear at - - - -

□ Left Ear at - - - - -

Bone Conduction — — — — —

|> Right Ear with masking at - - - -

<| Left Ear with masking at - - - -

Date	5/1/52	Time	1:00 P.M.
Name	Subject 5	Test	5
	Before Test		After Test
Pulse	72		68
Temperature	97.8°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good. I had a typhoid shot yesterday, but I am not too uncomfortable.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 6:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing except the shot.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very cool and comfortable. I like this temperature.

8. Comments by operator: Inconsistent threshold at 250 and 4000 cycles, right ear. Signal lights. No delay.

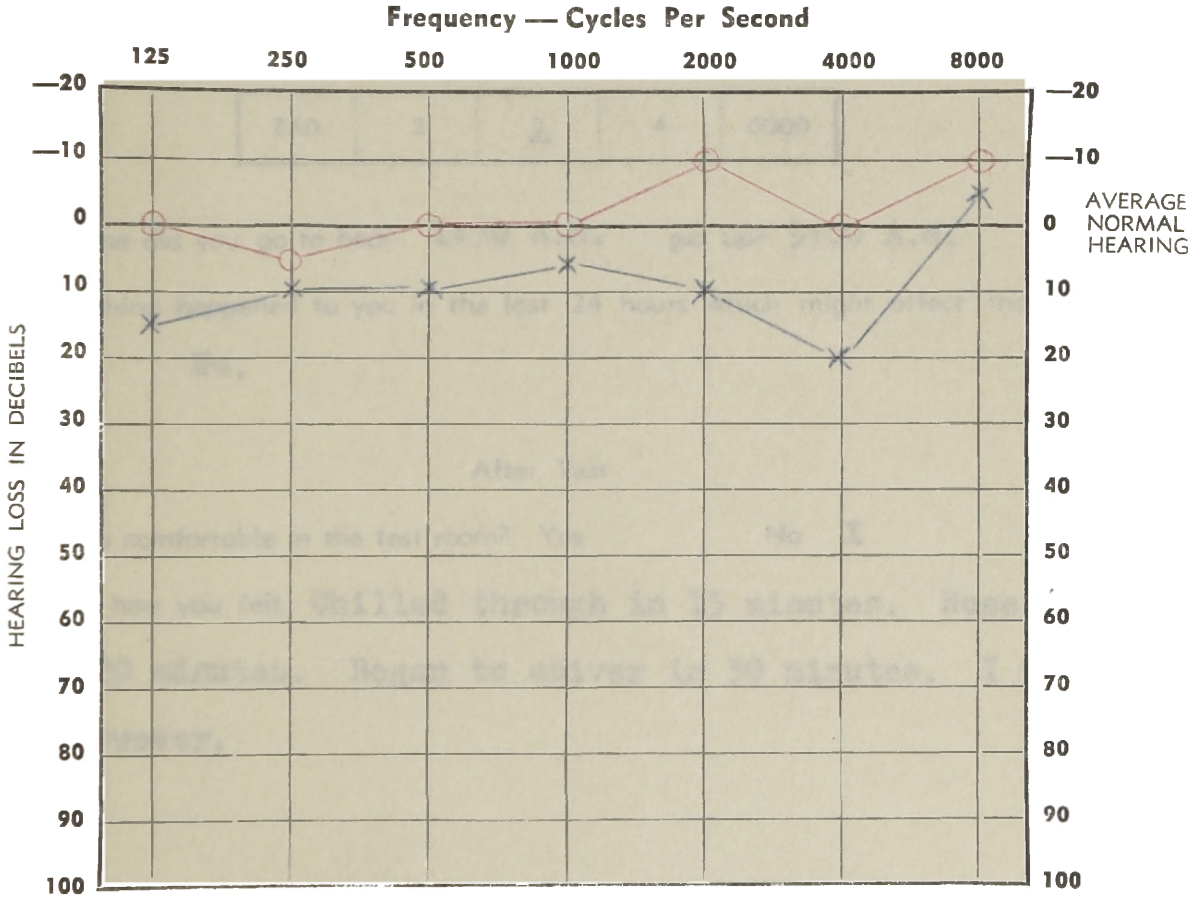
Questionnaire 33

Audiogram 39

Date 5/8/52 Time 1:00 P.M.

Name Subject 5 Test 6

	Inside Room	Outside
Temperature	20° F	60° F.
Relative Humidity	80%	55%
Barometric Pressure	29.20 Falling	29.04 Falling
		Wind NNE 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/8/52	Time	1:00 P.M.
Name	Subject 5	Test	6
	Before Test		After Test
Pulse	68		68
Temperature	98.6°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good. Had shots again yesterday, but they don't bother me too much.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:30 A.M. get up? 9:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Chilled through in 15 minutes. Nose running in 20 minutes. Began to shiver in 30 minutes. I felt alert, however.

8. Comments by operator: Consistent threshold at each frequency except 500 cycles, right ear. Signal lights: No delay.

Questionnaire 34

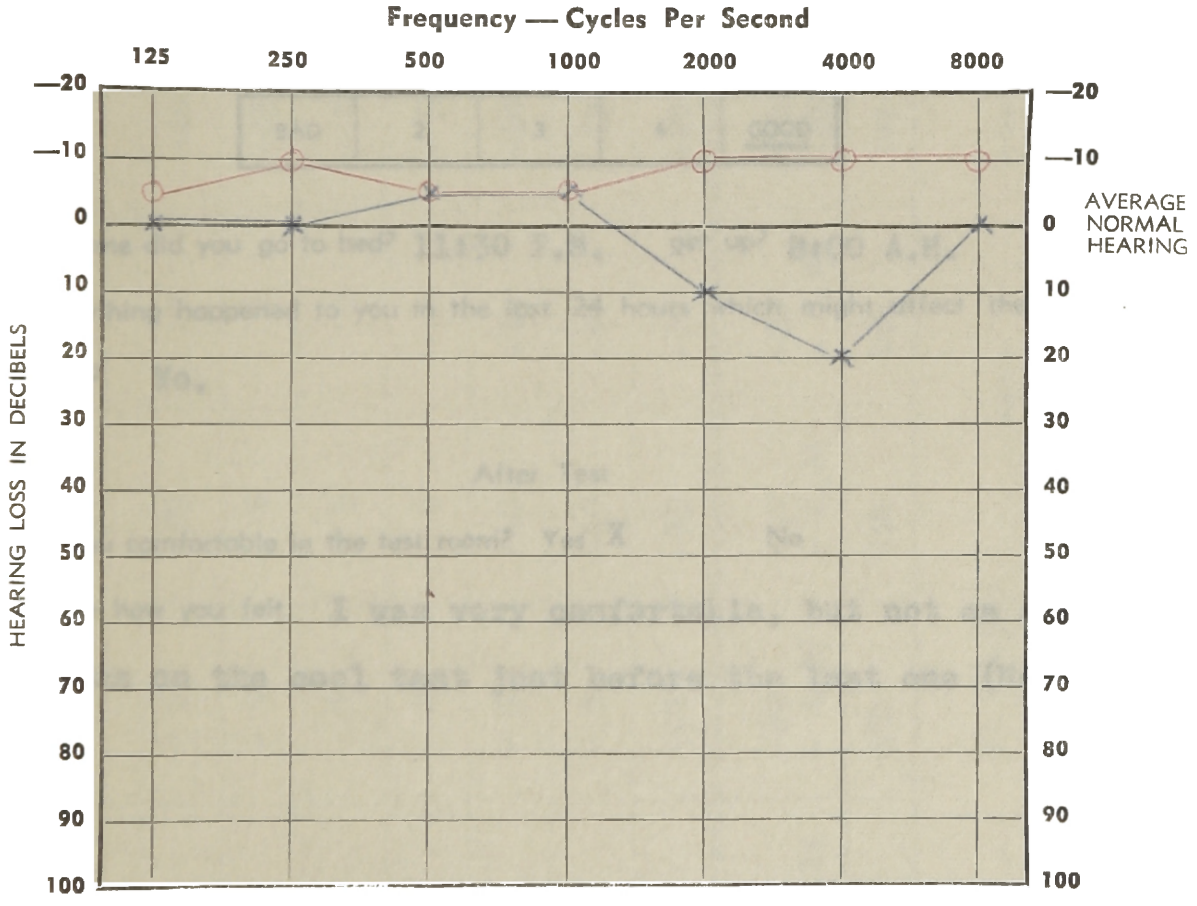
Audiogram 40

Date 5/12/52 Time 1:00 P.M.

Name Subject 5 Test 7

	Inside Room	Outside
Temperature	70° F.	50° F.
Relative Humidity	50%	71% Raining
Barometric Pressure	28.90 Steady	28.70 Steady

Wind W 22



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/12/52	Time	1:00 P.M.
Name	Subject 5	Test	7
	Before Test		After Test
Pulse	72		72
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Feel fine today.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was very comfortable, but not as alert feeling as on the cool test just before the last one (May 1st).

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Questionnaire 35

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	- 5	- 5	25	0	-10	0	- 5	35
250	- 5	- 5	- 5	0	-15	5	-10	20
500	- 5	0	- 5	0	- 5	0	- 5	5
1000	- 5	0	0	0	- 5	0	- 5	5
2000	-10	- 5	-10	-10	-10	-10	-10	5
4000	-10	- 5	-10	-10	-10	0	-10	10
8000	-10	-10	-15	-10	-20	-20	-10	10
Loss in db $\leq$ Loss Ave. Loss	-50 - 7.14	-30 - 4.28	-20 - 2.86	-30 - 4.28	-75 -10.71	-25 - 3.57	-55 - 7.86	55 7.86
Rank	3rd	4th	7th	4th	1st	6th	2nd	

Maximum Deviation of 55 (7.86) Decibels Subject 5

Between 50° 70% and 90° 65% Right Ear

TABLE IX

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	5	5	15	10	15	0	15
250	0	5	5	10	0	10	0	10
500	0	0	0	0	0	10	- 5	15
1000	- 5	0	- 5	- 5	- 5	5	- 5	10
2000	10	5	15	20	- 5	10	10	25
4000	20	20	20	15	15	20	20	5
8000	0	0	0	10	- 5	- 5	0	15
Loss in db Σ Loss Ave. Loss	25 3.57	35 5.00	40 5.71	65 9.28	10 1.42	65 9.28	20 2.86	55 7.86
Rank	3rd	4th	5th	7th	1st	7th	2nd	

Maximum Deviation of 55 (7.86) Decibels Subject 5

Between 50° 70% and {20° 80% / 90° 80%} Left Ear

TABLE X

Subject 6

1. Medical Findings

a. Physical Examination

Age: 21

Height: 76"

Weight: 174

Physical examination negative throughout

Tonsils have been removed

Abdomen and extremities normal

Chest X-Ray: Negative

Heart and lungs: Normal

Blood pressure: 120/70

b. Laboratory Examination

Urinalysis: Negative

Red blood count: 5,150,000

Hemoglobin: 107% 17.9 mgm. per 100 cc.

c. Oto-rhinolaryngeal Examination

History: No ear trouble. No deafness.

Examination:

Throat: Tonsils and adenoids removed

Nose: Negative

Nasopharynx: Negative

Larynx: Negative

Ears: Right and left tympanum negative

Advice: No treatment

Diagnosis: None

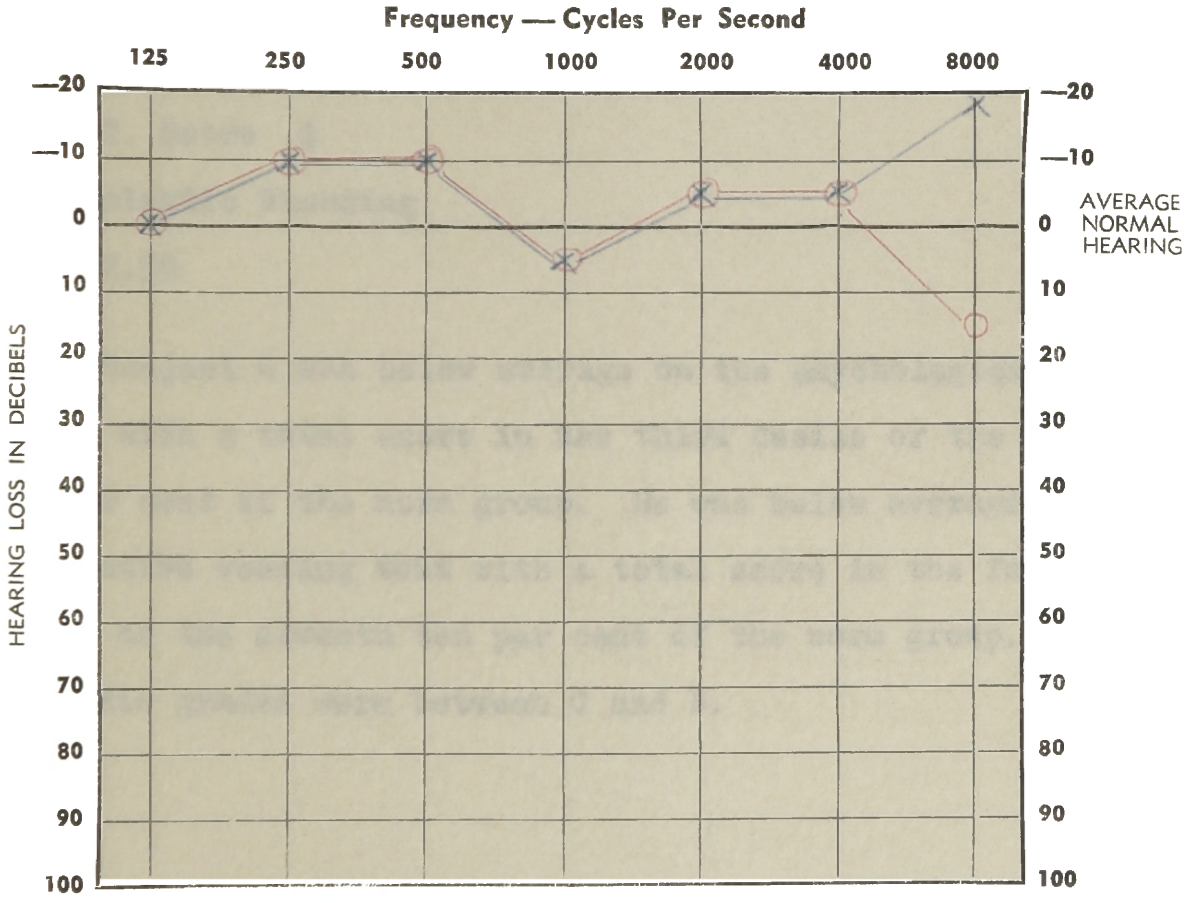
The medical findings were negative or within normal limits and revealed nothing pertinent to this study.

Audiogram 41

Date 11/2/51 Time 10:00 A.M.

Name Subject 6 Test Clinic

	Inside Room	Outside
Temperature		24° F.
Relative Humidity		88%
Barometric Pressure		29.00
Wind		SW 6



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Subject 6

2. Test Scores

Psychological Examination

Q. Score 4

L. Score 2

T. Score 3

Cooperative Test of Reading Comprehension

V. Score 4

R. Score 5

C. Score 4

T. Score 4

3. Scholastic Standing

2.50

Subject 6 was below average on the psychological examination with a total score in the third decile or the eighth ten per cent of the norm group. He was below average on the cooperative reading test with a total score in the fourth decile or the seventh ten per cent of the norm group.

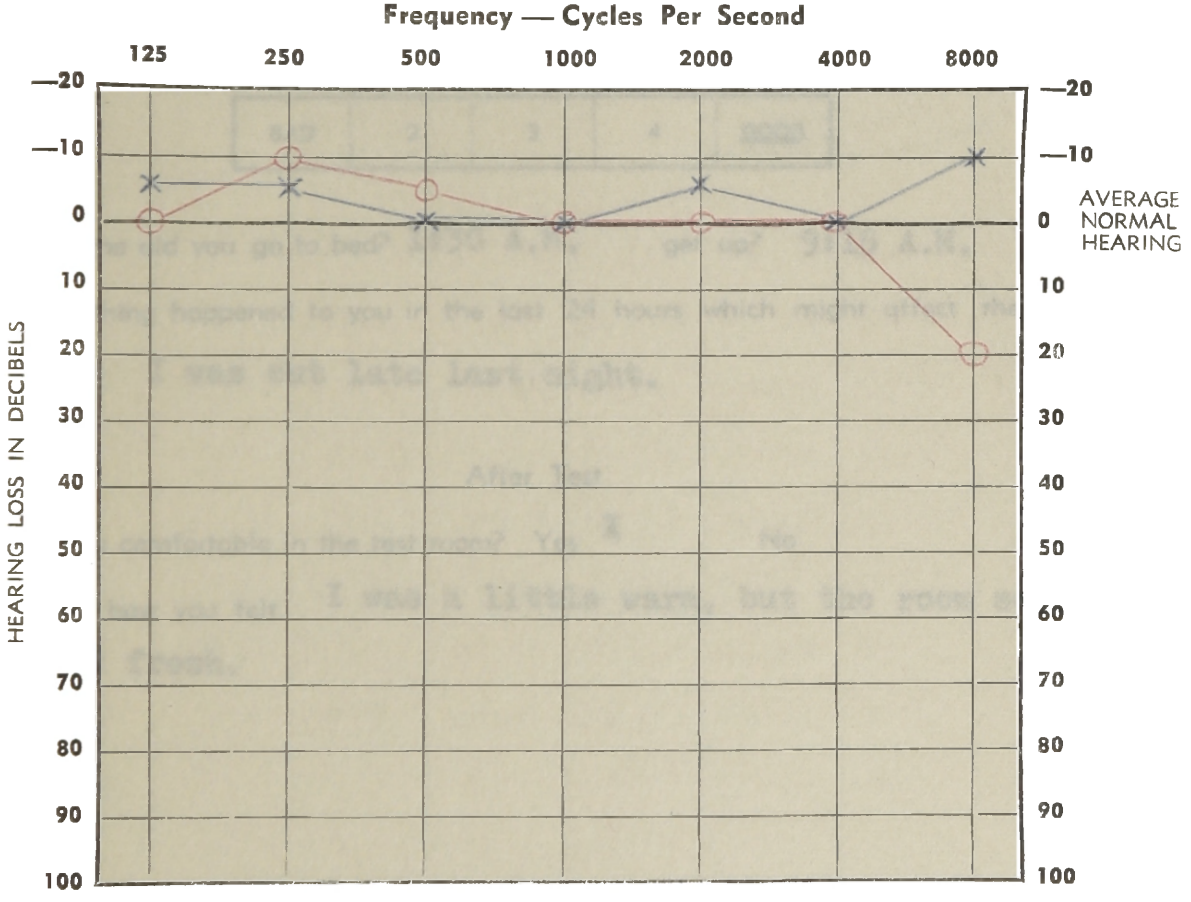
His grades were between C and B.

Audiogram 42

Date 4/8/52 Time 10:00 A.M.

Name Subject 6 Test 1

	Inside Room	Outside
Temperature	70° F.	42° F.
Relative Humidity	50%	96%
Barometric Pressure	29.50 Steady	29.31 Steady
Wind		Calm



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/8/52	Time	10:00 A.M.
Name	Subject 6	Test	1
	Before Test		After Test
Pulse	100		84
Temperature	97.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Tired, but content and happy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:30 A.M. get up? 9:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? I was out late last night.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was a little warm, but the room seemed clear and fresh.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

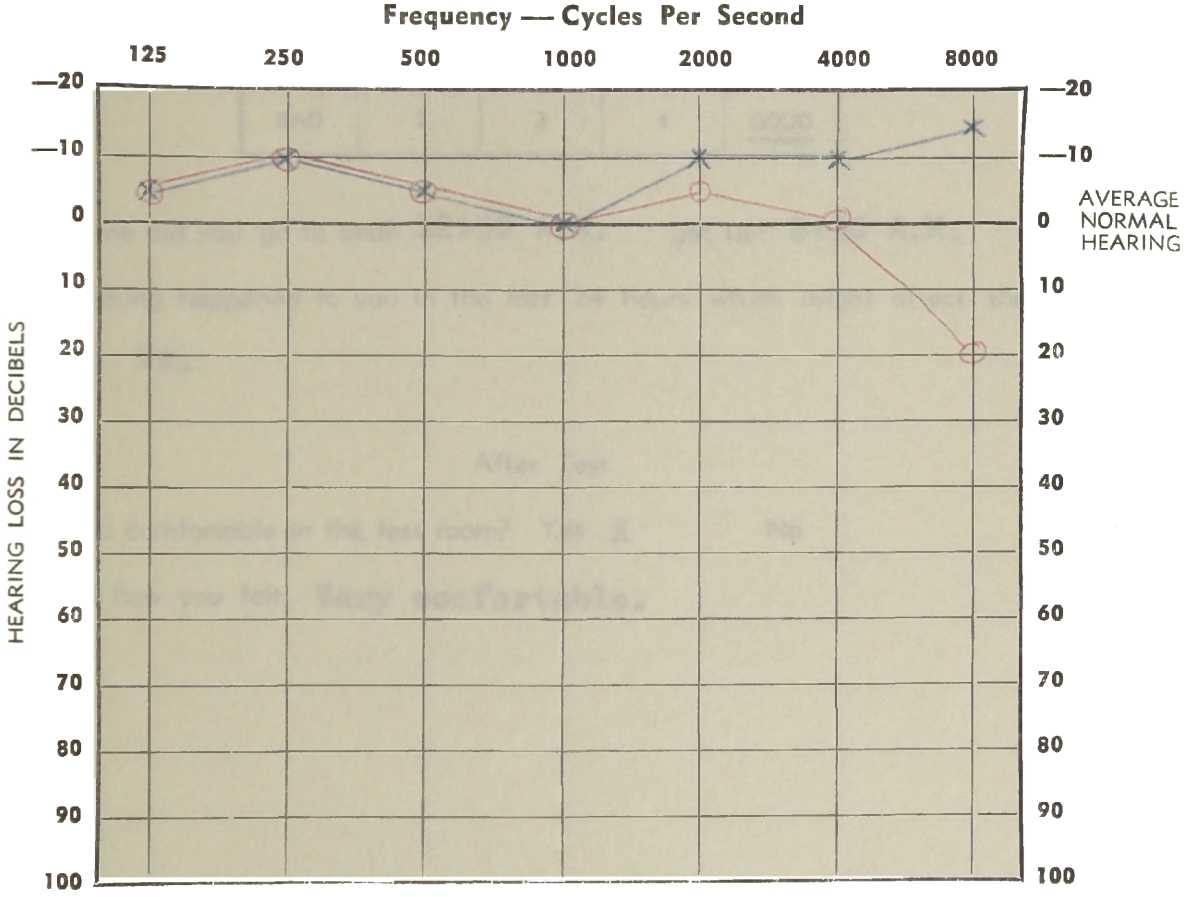
Questionnaire 36

Audiogram 43

Date 4/15/52 Time 10:00 A.M.

Name Subject 6 Test 2

	Inside Room	Outside
Temperature	70° F.	45° F.
Relative Humidity	65%	76% Light Rain
Barometric Pressure	29.20 Rising	29.03 Rising
		Wind NNW 15



Air Conduction - - - - - -

O Right Ear _ _ _ _

X Left Ear _____

with masking

△ Right Ear at _ _ _

□ Left Ear at _ _ _ _

Bone Conduction — — — — —

|> Right Ear with masking at _ _

<| Left Ear with masking at _ _

Date	4/15/52	Time	10:00 A.M.
Name	Subject 6	Test	2
	Before Test		After Test
Pulse	96		86
Temperature	98.2°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. A little tired and somewhat hurried.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very comfortable.

8. Comments by operator: Consistent threshold at each frequency.

Signal lights: No delay.

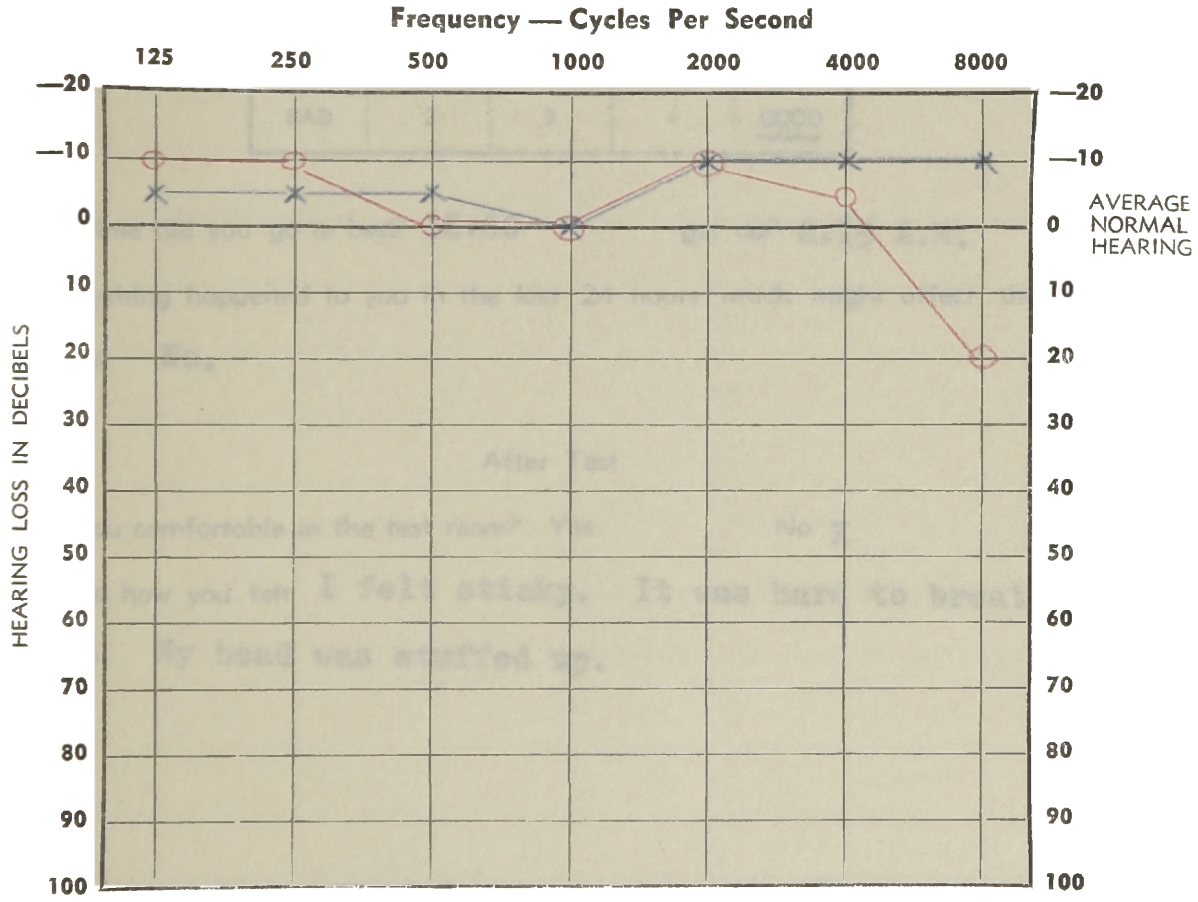
Questionnaire 37

Audiogram 44

Date 4/22/52 Time 10:00 A.M.

Name Subject 6 Test 3

	Inside Room	Outside
Temperature	90° F.	62° F.
Relative Humidity	65%	87% Raining
Barometric Pressure	29.21 Steady	29.03 Steady
		Wind SSW 18



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/22/52	Time	10:00 A.M.
Name	Subject 6	Test	3
	Before Test		After Test
Pulse	88		82
Temperature	97.4°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. It seems hard to breathe today. I feel tired like I do before a rain.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 8:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I felt sticky. It was hard to breathe in the room. My head was stuffed up.

8. Comments by operator: Consistent threshold at each frequency except 2000 cycles, right ear. Signal lights: Flickering after interrupter had cut out tone.

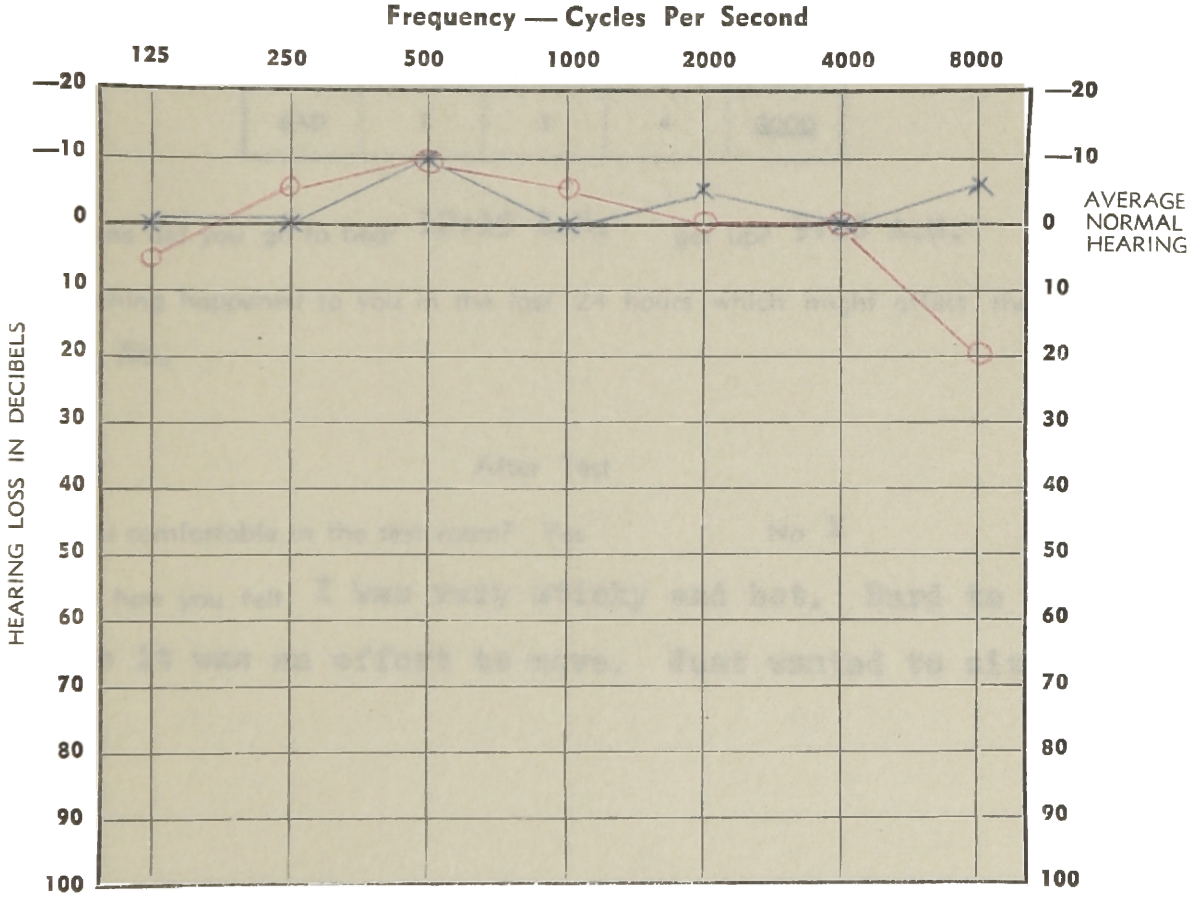
Questionnaire 38

Audiogram 45

Date 4/29/52 Time 10:00 A.M.

Name Subject 6 Test 4

	Inside Room	Outside
Temperature	90° F.	65° F.
Relative Humidity	80%	80%
Barometric Pressure	29.26 Steady	29.07
		Wind NNE 4



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/29/52	Time	10:00 A.M.
Name	Subject 6	Test	4
	Before Test		After Test
Pulse	89		94
Temperature	97.8°		99°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I am sleepy and a little concerned about the amount of school work I have to do.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:15 A.M. get up? 9:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was very sticky and hot. Hard to breathe. Felt like it was an effort to move. Just wanted to sit in one place.

8. Comments by operator: Profuse sweating after 6 minutes. Signal lights: 9 to 12 seconds delay. Consistent threshold at each frequency except 500, 2000, 4000 and 8000 cycles, left ear.

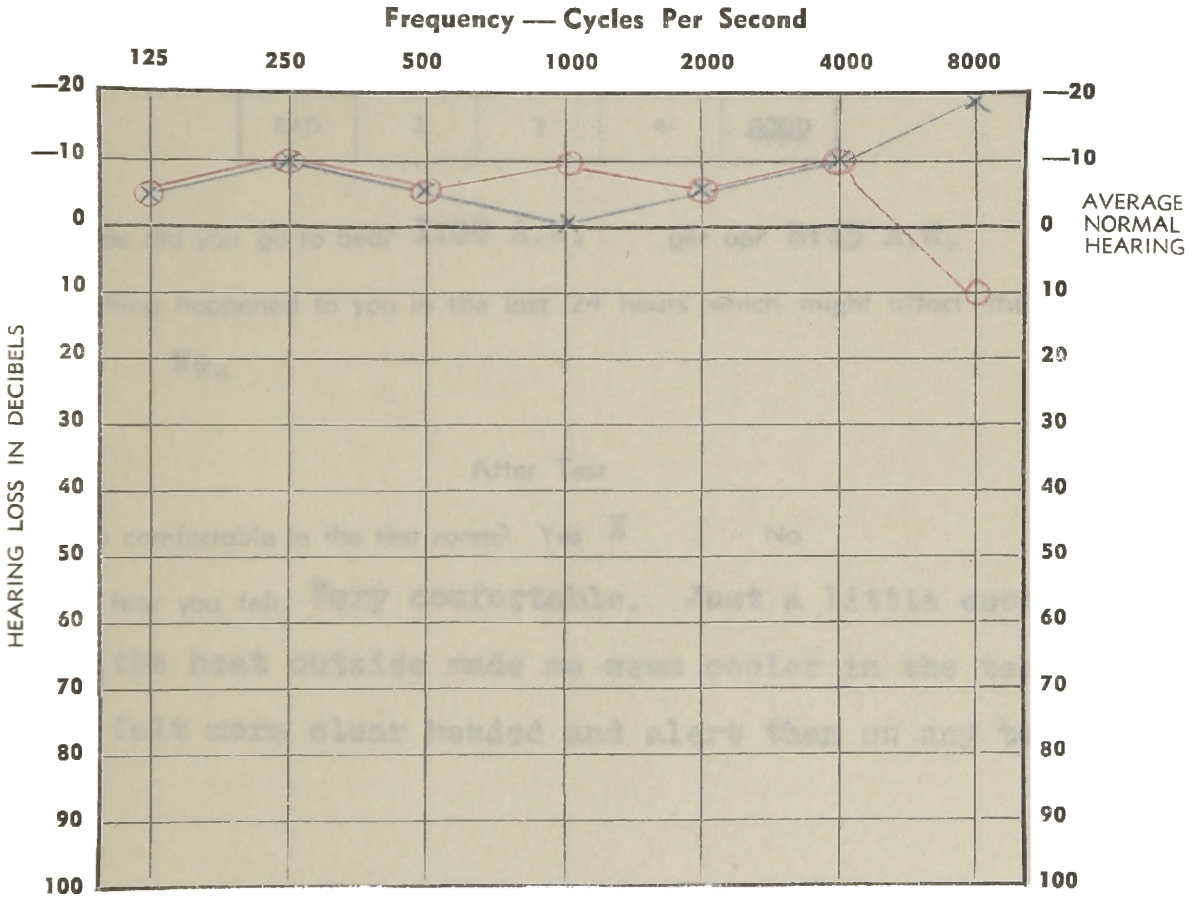
Questionnaire 39

Audiogram 46

Date 5/1/52 Time 10:00 A.M.

Name Subject 6 Test 5

	Inside Room	Outside
Temperature	50° F.	69° F
Relative Humidity	70%	55%
Barometric Pressure	29.22 Falling	29.06 Falling
		Wind S 5



Air Conduction - - - - -

O Right Ear_____

X Left Ear_____

with masking

△ Right Ear at - - - -

□ Left Ear at - - - - -

Bone Conduction ————————

|> Right Ear with masking at

<| Left Ear with masking at - - -

Date	5/1/52	Time	10:00 A.M.
Name	Subject 6	Test	5
	Before Test		After Test
Pulse	96		68
Temperature	98.6°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Happy. Just a bit concerned about school work, term papers and senior exams.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:00 A.M. get up? 8:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very comfortable. Just a little cool. Probably the heat outside made me seem cooler in the test room. I felt more clear headed and alert than on any test so far.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

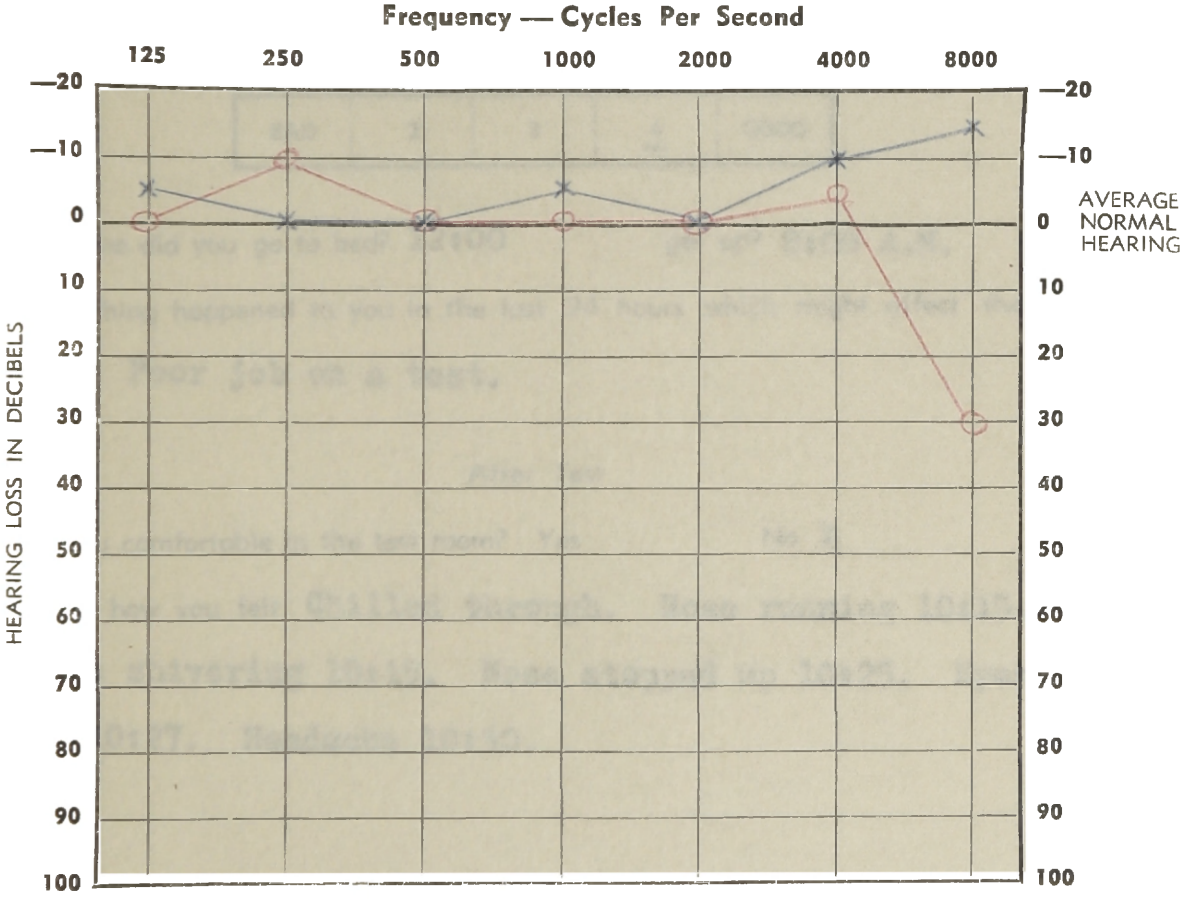
Questionnaire 40

Audiogram 47

Date 5/8/52 Time 10:00 A.M.

Name Subject 6 Test 6

	Inside Room	Outside
Temperature	20° F.	47° F.
Relative Humidity	80%	86% Raining
Barometric Pressure	29.26 Falling	29.04 Falling
		Wind E 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/8/52	Time	10:00 A.M.
Name	Subject 6	Test	6
	Before Test		After Test
Pulse	76		68
Temperature	98.2°		97.7°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Disgusted with myself over a test.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Poor job on a test.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Chilled through. Nose running 10:15. Spasmodic shivering 10:15. Nose stopped up 10:25. Eyes running 10:27. Headache 10:30.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay. Ears and nose red after 20 minutes in that room. Shivering noted.

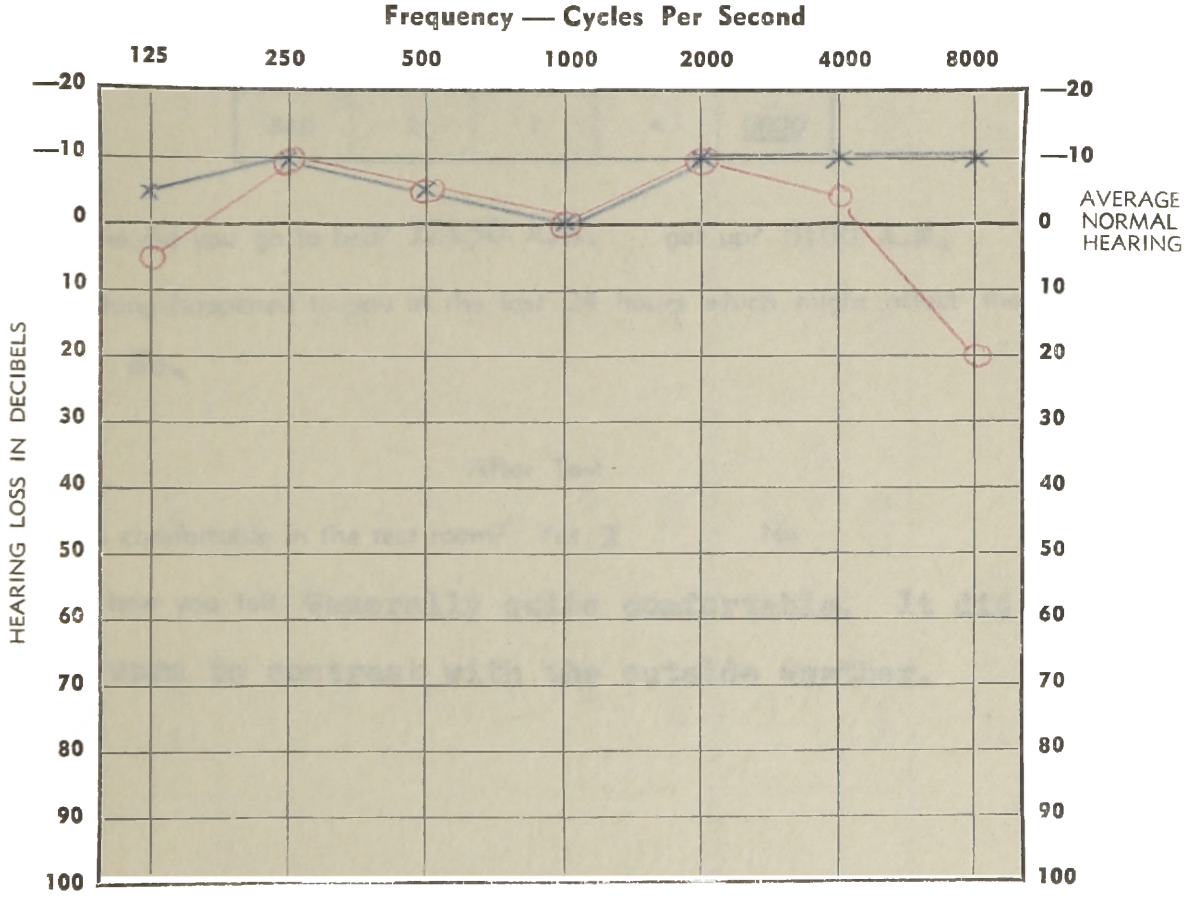
Questionnaire 41

Audiogram 48

Date 5/13/52 Time 10:00 A.M.

Name Subject 6 Test 7

	Inside Room	Outside
Temperature	70° F.	54° F.
Relative Humidity	50%	65% Light Rain A.M.
Barometric Pressure	29.96 Rising	28.86 Rising
		Wind W 20



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/13/52	Time	10:00 A.M.
Name	Subject 6	Test	7
	Before Test		After Test
Pulse	79		74
Temperature	98.0°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Happy and contented.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Generally quite comfortable. It did seem a little warm in contrast with the outside weather.

8. Comments by operator: Consistent threshold at each frequency except 8000 cycles, right ear. Signal lights: No delay.

Questionnaire 42

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	- 5	-10	5	- 5	0	5	15
250	-10	-10	-10	- 5	-10	-10	-10	5
500	- 5	- 5	0	-10	- 5	0	- 5	10
1000	0	0	0	- 5	-10	0	0	10
2000	0	- 5	-10	0	- 5	0	-10	10
4000	0	0	- 5	0	-10	- 5	- 5	10
8000	20	20	20	20	10	30	20	20
Loss in db Σ Loss Ave. Loss	5 .72	- 5 -.72	-15 - 2.14	5 .72	-35 - 5.00	15 2.14	- 5 -.72	50 7.14
Rank	5th	3rd	2nd	5th	1st	7th	3rd	

Maximum Deviation of 50 (7.14) Decibels

Between 50° 70% and 20° 80%

Subject 6

Right Ear

TABLE XI

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	- 5	- 5	- 5	0	- 5	- 5	- 5	5
250	- 5	-10	- 5	0	-10	0	-10	10
500	0	- 5	- 5	-10	- 5	0	- 5	10
1000	0	0	0	0	0	5	0	5
2000	- 5	-10	-10	- 5	- 5	0	-10	10
4000	0	-10	-10	0	-10	-10	-10	10
8000	-10	- 5	-10	- 5	-20	-15	-10	15
Loss in db Σ Loss Ave. Loss	-25 - 3.57	-45 - 6.42	-45 - 6.42	-20 - 2.86	-55 - 7.86	-25 - 3.57	-50 - 7.14	35 5.00
Rank	5th	3rd	3rd	7th	1st	5th	2nd	

Maximum Deviation of 35 (5.00) Decibels Subject 6

Between 50° 70% and 90° 80% Left Ear

TABLE XII

Subject 7

1. Medical Findings

   a. Physical Examination

      Age: 20

      Height: 68"

      Weight: 145

      Head, ears and nose normal

      Tonsils removed and teeth in good repair

      Heart and lungs: Normal

      Chest X-Ray: Negative

      Blood pressure: 110/80

      Abdomen: Normal. Old appendix scar.

      Extremities: Normal. Patient reports that extremities get unusually cold during the winter months.

      Had polio in 1943. Left side paralyzed.

      Hospitalized ten months. No evidence of paralysis now.

      Respiration: Normal. Patient reports that he has difficulty breathing during excessively hot weather. Was not aware of the problem until after he had polio.

   b. Laboratory Examination

      Urinalysis: Negative

      Red blood count: 5,160,000

      Hemoglobin: 107% 16.7 mgm. per 100 cc.

      White blood count: 6,000

c. Oto-rhinolaryngeal Examination

History: No ear trouble. No tinnitus or ear infection.

Examination:

Throat: Adenoids and tonsils cleanly removed

Nose: Normal

Ears: Right and left tympanum normal.

Audiogram normal.

Advice: None

Diagnosis: None

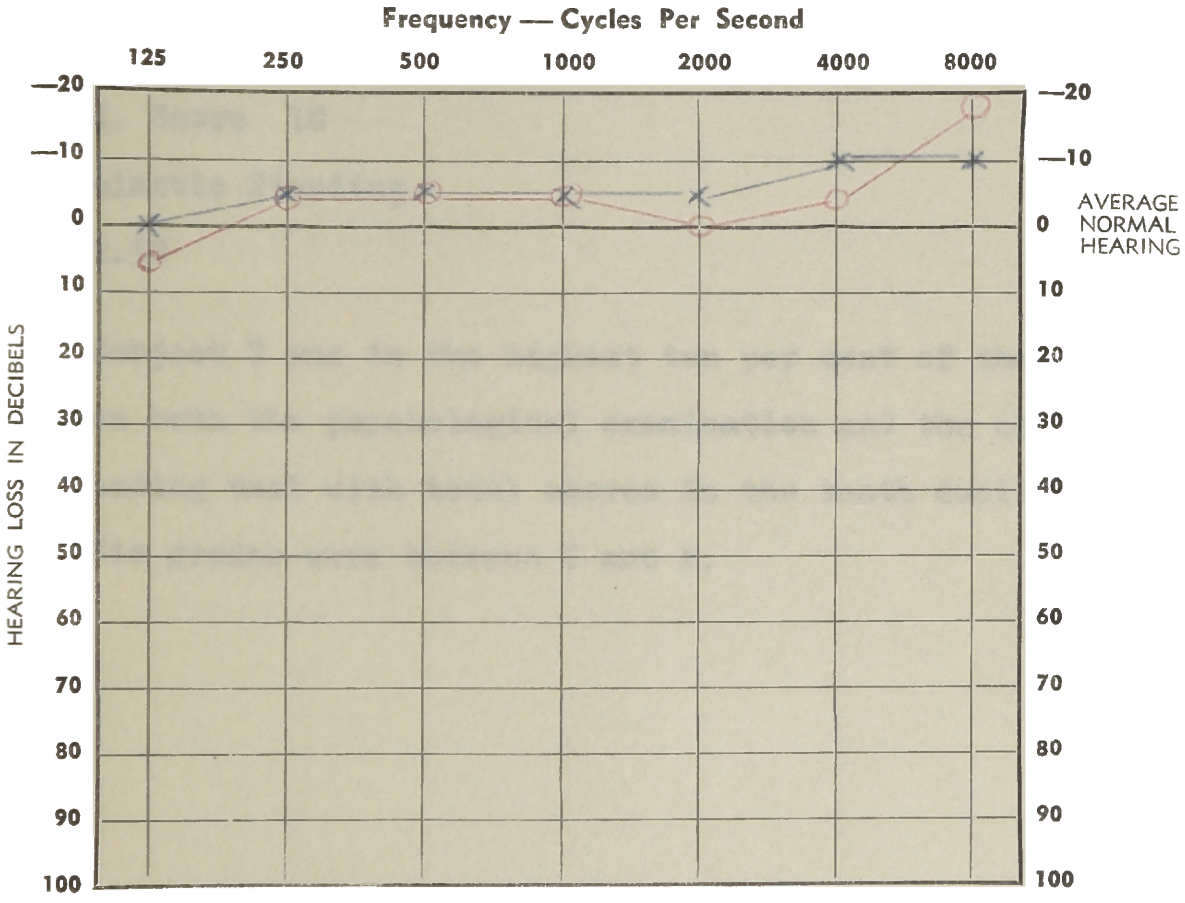
With the exception of a history of polio, the medical findings were negative or within normal limits. The patient's report that he had noted changes in bodily reactions to weather changes was pertinent to this study.

Audiogram 49

Date 10/31/51 Time 10:00 A.M.

Name Subject 7 Test Clinic

	Inside Room	Outside
Temperature		37° F.
Relative Humidity		61%
Barometric Pressure		29.05
Wind		W 24



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Subject 7

2. Test Scores

Psychological Examination

Q. Score 10

L. Score 10

T. Score 10

Cooperative Test of Reading Comprehension

V. Score 10

R. Score 10

C. Score 10

T. Score 10

3. Scholastic Standing

2.58

Subject 7 was in the highest ten per cent of the norm group on both the psychological examination and the cooperative reading test with total scores in the tenth decile.

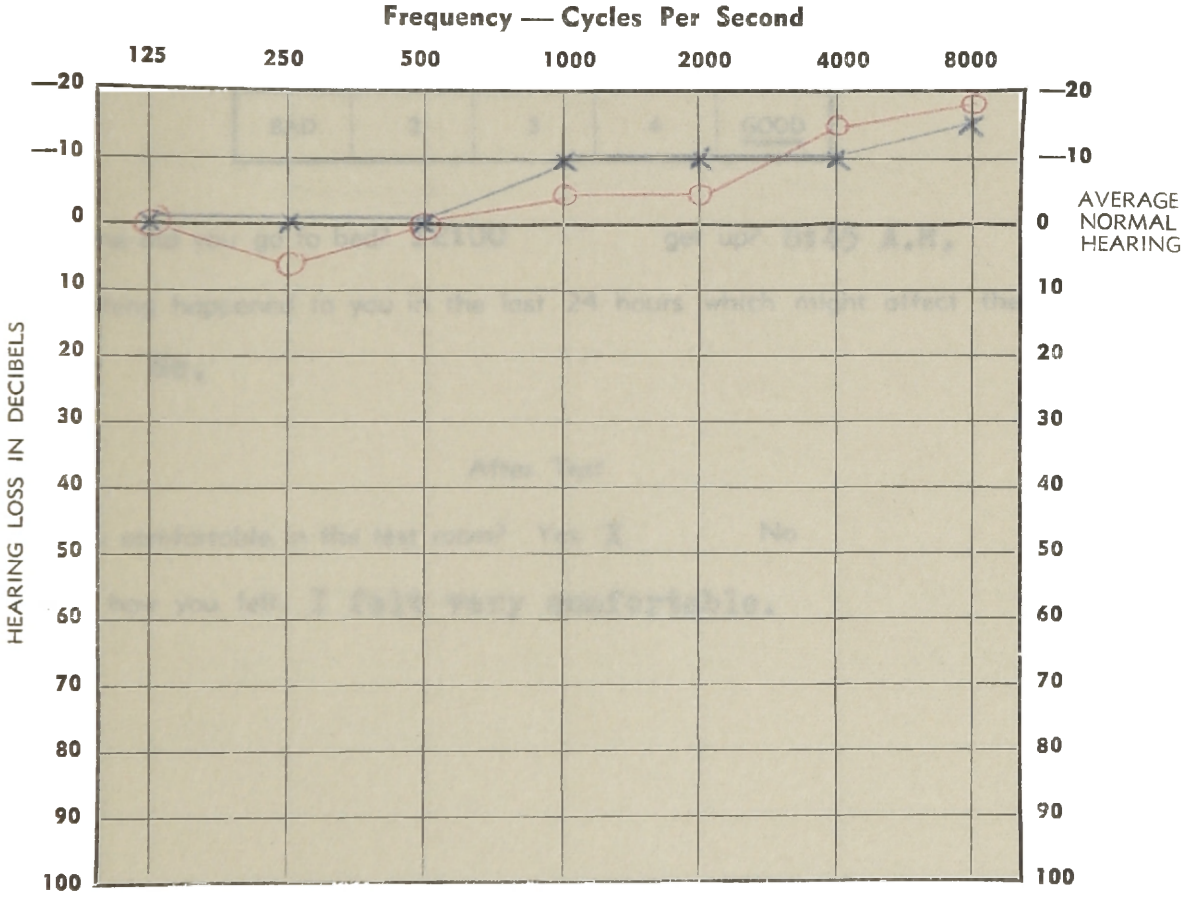
His grades were between C and B.

Audiogram 50

Date 4/8/52 Time 4:00 P.M.

Name Subject 7 Test 1

	Inside Room	Outside
Temperature	70° F.	48° F.
Relative Humidity	50%	58%
Barometric Pressure	29.50 Steady	29.33 Steady
		Wind E 8



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/8/52	Time	4:00 P.M.
Name	Subject 7	Test	1
	Before Test		After Test
Pulse	100		84
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel very good -- "Springish." I have a slight runny nose, but from the weather and not from a cold.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 8:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I felt very comfortable.

8. Comments by operator: Inconsistent threshold at 125, 250, 4000 and 8000 cycles, both ears. Minor adjustments being made on equipment. Validity of test questionable.

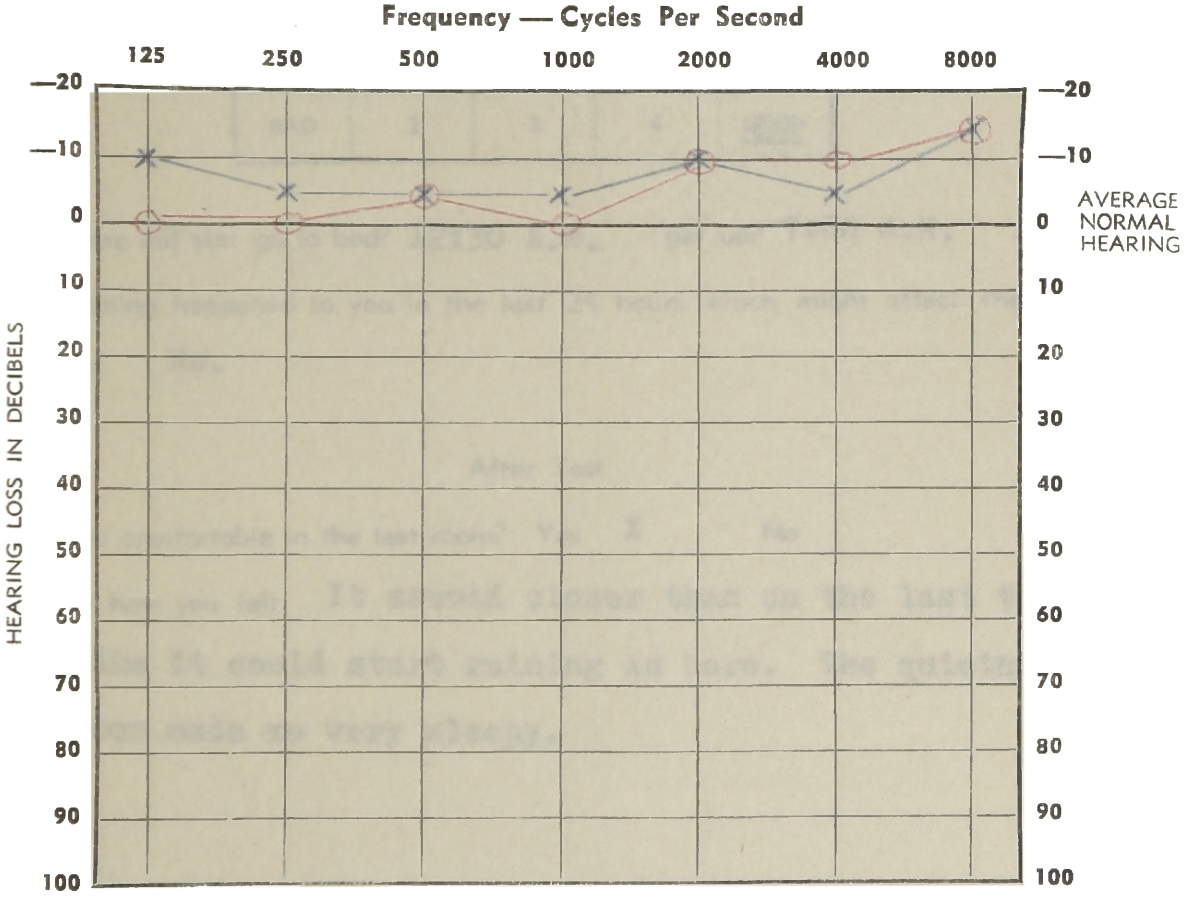
Questionnaire 43

Audiogram 51

Date 4/17/52 Time 2:00 P.M.

Name Subject 7 Test 2

	Inside Room	Outside
Temperature	70° F.	66° F.
Relative Humidity	65%	31%
Barometric Pressure	29.36 Falling	29.22 Falling
		Wind W 20



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - - -

□ Left Ear at _____

Bone Conduction — — — — —

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date	4/17/52	Time	2:00 P.M.
Name	Subject 7	Test	2
	Before Test		After Test
Pulse	96		72
Temperature	98.4°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Relaxed, comfortable, but a little sleepy — the gappy and noddy stage.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. It seemed closer than on the last test. Almost like it could start raining in here. The quietness of the room made me very sleepy.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay. Subject seemed relaxed during waiting period.

Questionnaire 44

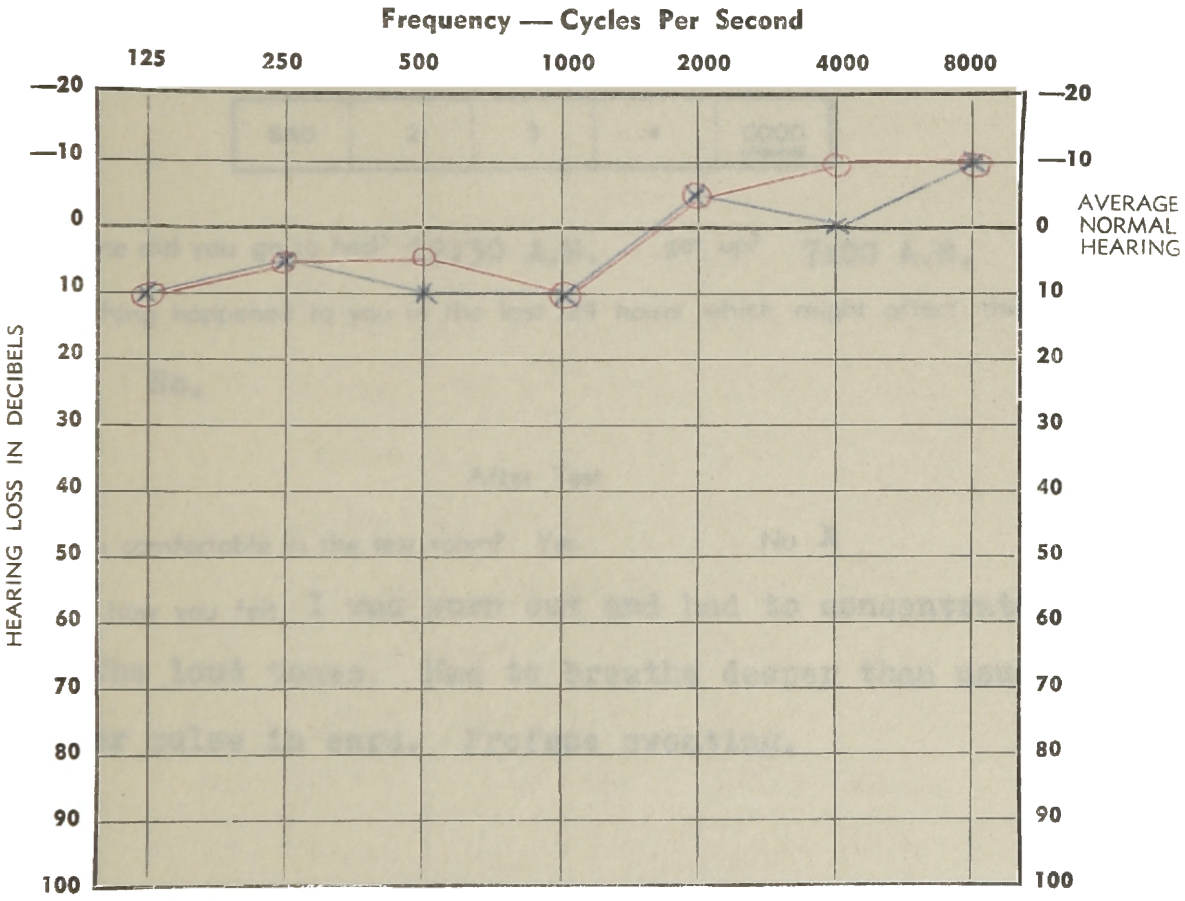
Audiogram 52

Date 4/24/52 Time 1:00 P.M.

Name Subject 7 Test 3

	Inside Room	Outside
Temperature	90° F.	60° F.
Relative Humidity	65%	29%
Barometric Pressure	29.43 Falling	29.20 Falling

Wind ENE 19



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/24/52	Time	1:00 P.M.
Name	Subject 7	Test	3
	Before Test		After Test
Pulse	96		92
Temperature	97.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good. I am happy and contented.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was worn out and had to concentrate -- even on the loud tones. Had to breathe deeper than usual. Could hear pulse in ears. Profuse sweating.

8. Comments by operator: Profuse sweating after 5 minutes. Nervous movements. Seemed to be in a stupor during test. Signal lights: 6 to 10 seconds delay. See Medical History.

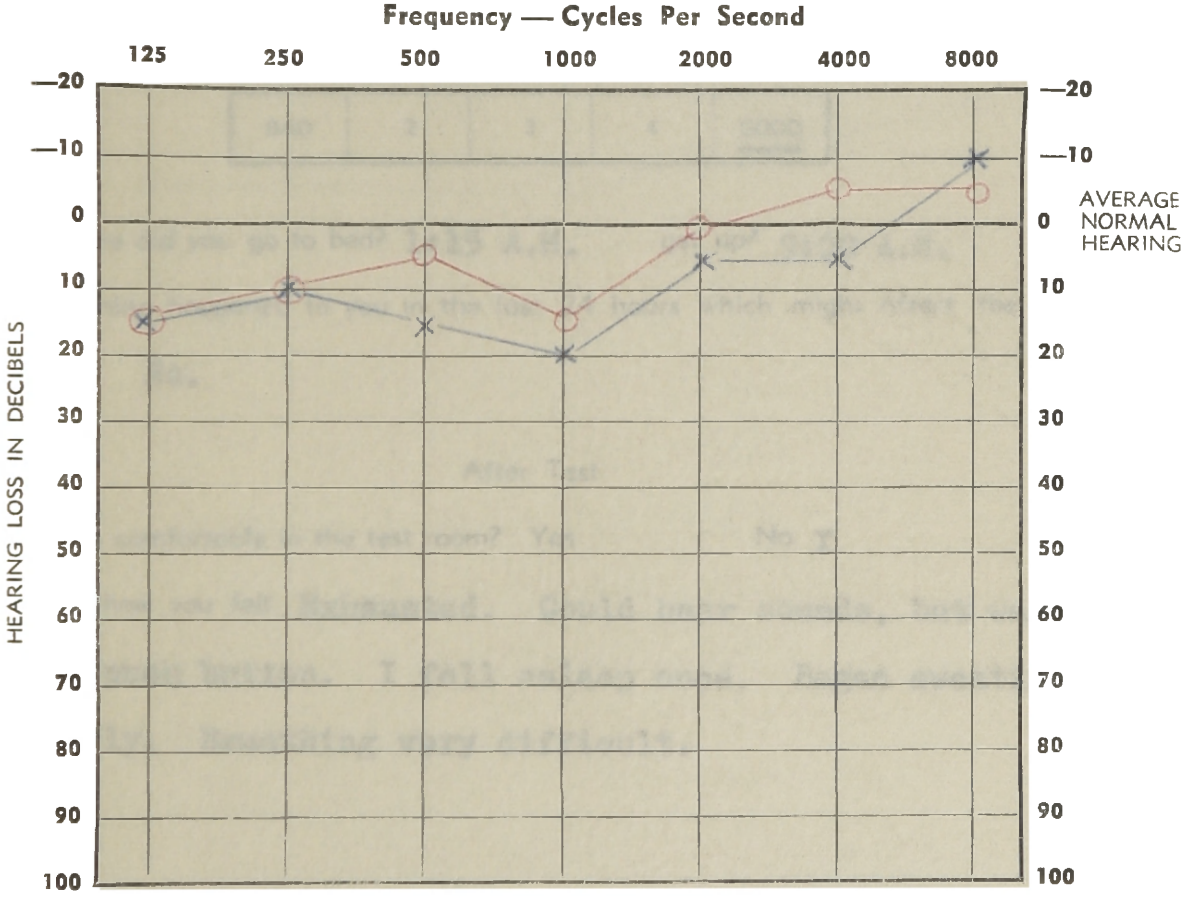
Questionnaire 45

Audiogram 53

Date 4/28/52 Time 12:30 P.M.

Name Subject 7 Test 4

	Inside Room	Outside
Temperature	90° F.	70° F.
Relative Humidity	80%	44%
Barometric Pressure	29.10 Rising	28.98 Rising
		Wind N 20



Air Conduction - - - - - -

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction ——————

|> Right Ear with masking at

<| Left Ear with masking at

Date	4/28/52	Time	12:30 P.M.
Name	Subject 7	Test	4
	Before Test		After Test
Pulse	92		100
Temperature	97.8°		99.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Happy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 1:15 A.M. get up? 9:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Exhausted. Could hear sounds, but was too tired to push button. I fell asleep once. Began sweating immediately. Breathing very difficult.

8. Comments by operator: Profuse sweating after 5 minutes. Marked flushing of skin on neck and underjaw. Seemed asleep during part of test. Signal lights: 8 to 12 seconds delay. See Medical History.

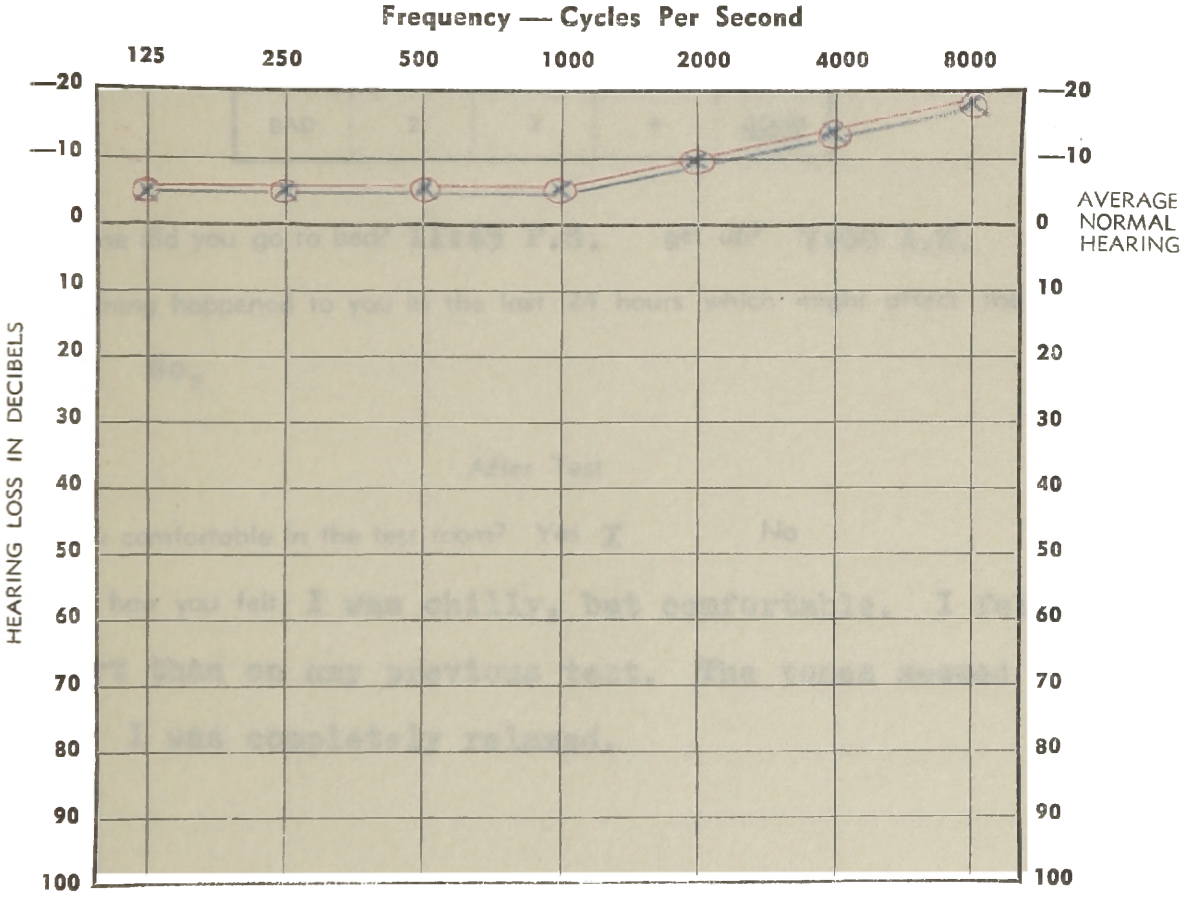
Questionnaire 46

Audiogram 54

Date 5/1/52 Time 11:00 A.M.

Name Subject 7 Test 5

	Inside Room	Outside
Temperature	50° F.	73° F.
Relative Humidity	70%	35%
Barometric Pressure	29.22 Falling	29.06 Falling
Wind	S 5	



Air Conduction - - - - - -

O Right Ear

X Left Ear

with masking

△ Right Ear at - - - -

□ Left Ear at ——

Bone Conduction ——————

|> Right Ear with masking at

<| Left Ear with masking at

Date	5/1/52	Time	11:00 A.M.
Name	Subject 7	Test	5
	Before Test		After Test
Pulse	84		80
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Contented and happy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:45 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was chilly, but comfortable. I felt more alert than on any previous test. The tones seemed clearer. I was completely relaxed.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

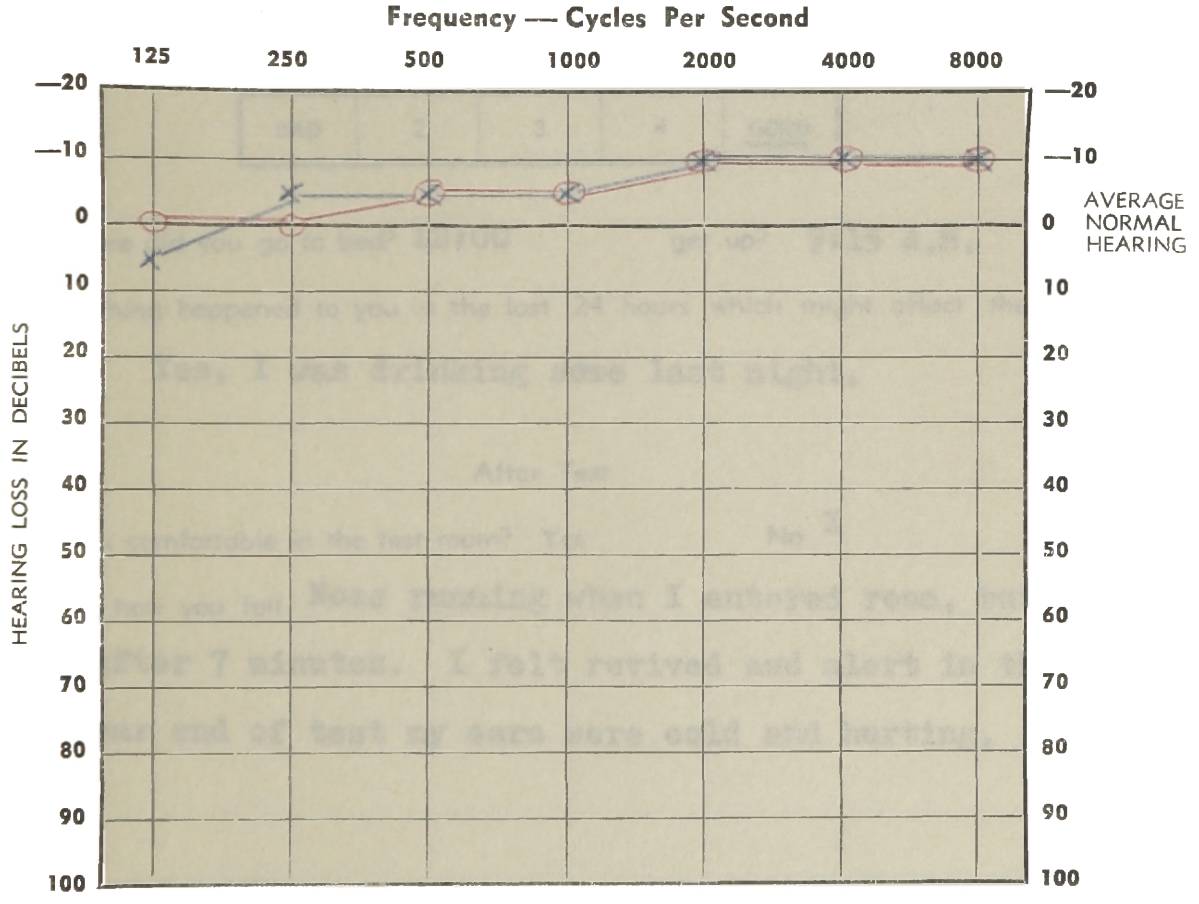
Questionnaire 47

Audiogram 55

Date 5/6/52 Time 1:00 P.M.

Name Subject 7 Test 6

	Inside Room	Outside
Temperature	20° F.	64° F.
Relative Humidity	80%	43%
Barometric Pressure	29.12 Rising	28.99 Rising
		Wind W 30



Air Conduction - - - - - -

O Right Ear _ _ _ _

X Left Ear _ _ _ _

with masking

△ Right Ear at - - - -

□ Left Ear at _ _ _ _

Bone Conduction ——————

|> Right Ear with masking at - - -

<| Left Ear with masking at - - -

Date	5/6/52	Time	1:00 P.M.
Name	Subject 7	Test	6
	Before Test		After Test
Pulse	88		84
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Happy and contented, but lazy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 9:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Yes, I was drinking some last night.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Nose running when I entered room, but it cleared after 7 minutes. I felt revived and alert in the room. Near end of test my ears were cold and hurting.

8. Comments by operator: Cheeks pink after 10 minutes. Ears red after 25 minutes. Consistent threshold at each frequency except 4000 and 8000 cycles, both ears. Signal lights: No delay.

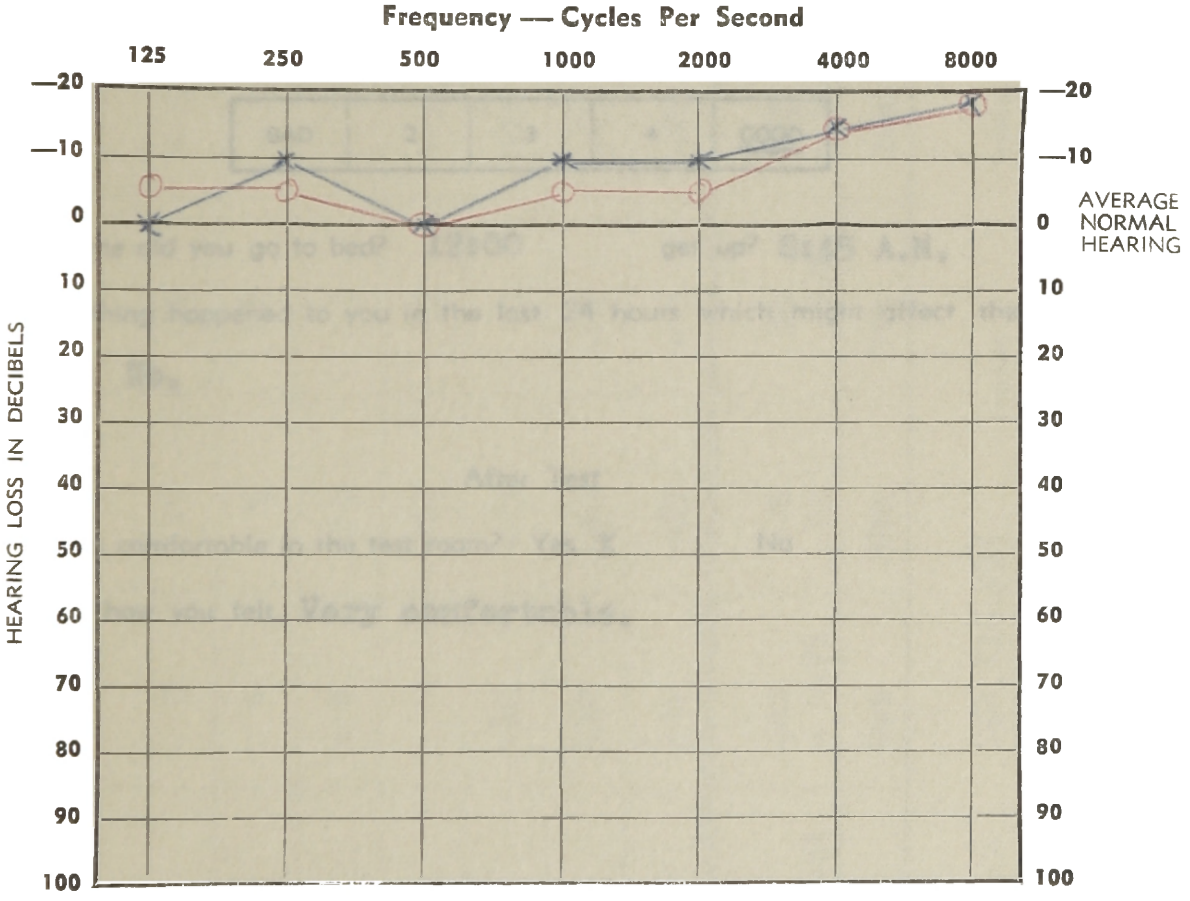
Questionnaire 48

Audiogram 56

Date 5/13/52 Time 1:00 P.M.

Name Subject 7 Test 7

	Inside Room	Outside
Temperature	70° F.	64° F.
Relative Humidity	50%	36%
Barometric Pressure	29.01 Rising	28.92 Rising
Wind		W 20



Air Conduction ——— - - -

O Right Ear_____

X Left Ear _____

with masking

△ Right Ear at - - - -

□ Left Ear at _____

Bone Conduction — — — — —

|> Right Ear with masking at - -

<| Left Ear with masking at - -

Date	5/13/52	Time	1:00 P.M.
Name	Subject 7	Test	7
	Before Test		After Test
Pulse	92		80
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Happy and contented.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 8:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very comfortable.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Questionnaire 49

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	0	10	15	- 5	0	- 5	20
250	5	0	5	10	- 5	0	- 5	15
500	0	- 5	5	5	- 5	- 5	0	10
1000	- 5	0	10	15	- 5	- 5	- 5	20
2000	- 5	-10	- 5	0	-10	-10	- 5	10
4000	-15	-10	-10	- 5	-15	-10	-15	10
8000	-20	-15	-10	- 5	-20	-10	-20	15
Loss in db ≤ Loss Ave. Loss	-40 - 5.71	-40 - 5.71	5 .72	35 5.00	-65 - 9.28	-40 - 5.71	-55 - 7.86	100 14.28
Rank	3rd	3rd	6th	7th	1st	3rd	2ne	

Maximum Deviation of 100 (14.28) Decibels Subject 7

Between 50° 70% and 90° 80% Right Ear

TABLE XIII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	-10	10	15	- 5	5	0	20
250	0	- 5	5	10	- 5	- 5	-10	15
500	0	- 5	10	15	- 5	- 5	0	20
1000	-10	- 5	10	20	- 5	- 5	-10	30
2000	-10	-10	- 5	5	-10	-10	-10	15
4000	-10	- 5	0	5	-15	-10	-15	20
8000	-15	-15	-10	-10	-20	-10	-20	10
Loss in db Σ Loss Ave. Loss	-45 - 6.42	-55 - 7.86	20 2.86	60 8.57	-65 - 9.28	-40 - 5.71	-65 - 9.28	125 17.85
Rank	4th	3rd	6th	7th	1st	5th	1st	

Maximum Deviation of 125 (17.85) Decibels Subject 7

Between (50° 70%
(70° 50% and 90° 80% Left Ear

TABLE XIV

Subject 8

1. Medical Findings

a. Physical Examination

Age: 20

Height: 73"

Weight: 170

Poor posture. Marked lumbar lordosis and dorsal kyphosis. Lateral curvature in low spine. All reflexes hyperactive. Ankle clonus. Poor physical coordination. Probably mild spastic. Otherwise physical examination negative.

Chest X-Ray: Negative

b. Laboratory Examination

Urinalysis:

Specific gravity 1.027

Albumin and sugar: Negative

Red blood count: 4,500,000

Hemoglobin: 84% 14. mgm. per 100 cc.

c. Oto-rhinolaryngeal Examination

History: Intermittent suppurative otitis media left since childhood. Ear draining until year ago. None since. Deafness in left ear for years. Is subject to frequent colds accompanied by dull headaches on left side of head.

Examination:

Throat: Tonsils and adenoids cleanly removed

Nose: Negative

Sinus: Negative

Ears: Right tympanum negative. Left tympanum large perforation. Middle ear dry.

Advice: No treatment

Diagnosis: Perforation left tympanum. Obstructive deafness left.

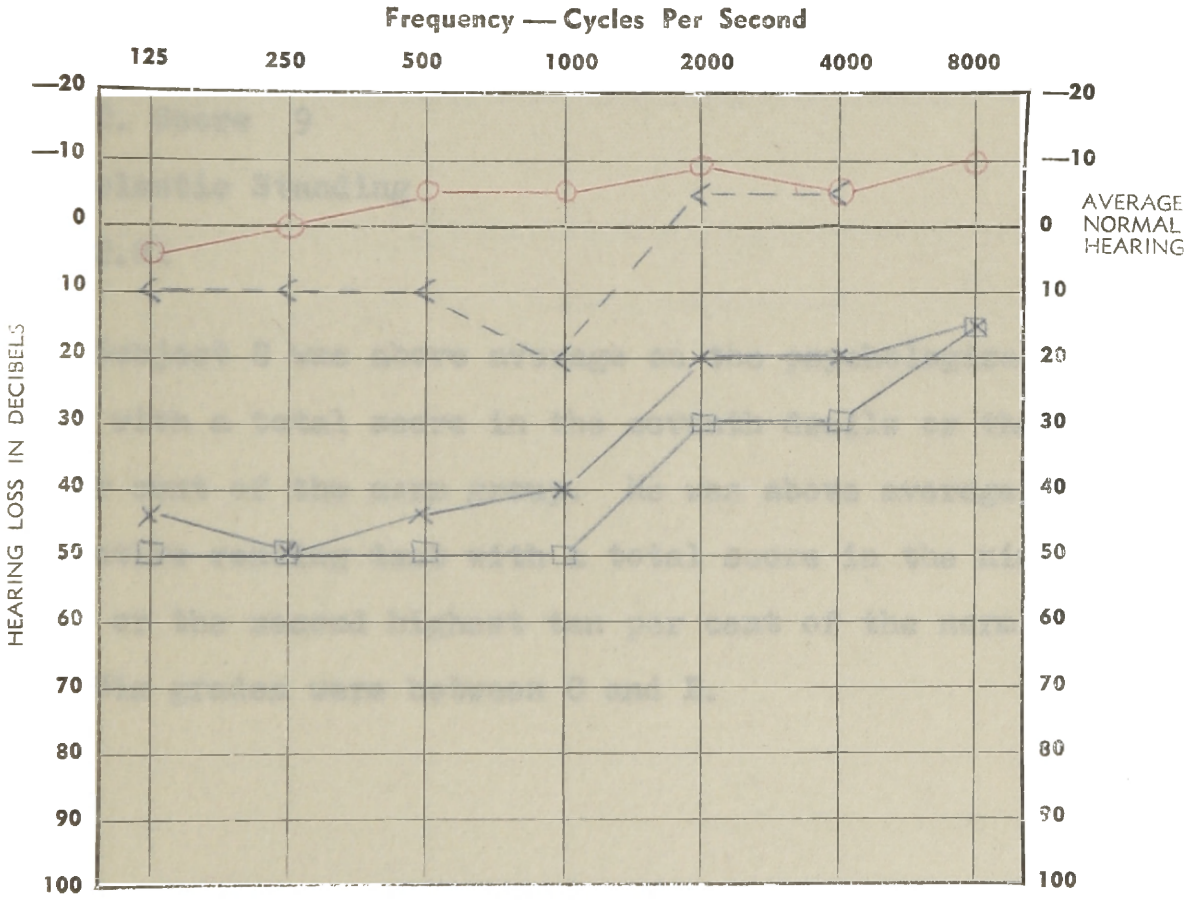
Subject 8 was diagnosed as "probably a mild spastic." His poor physical coordination was pertinent to this study since the subjects were timed on their signal light responses to the auditory stimuli. The oto-rhinolaryngeal examination revealed that he had a perforated left tympanum and obstructive deafness left. The subject's report that he has frequent colds accompanied by dull headaches on the left side was pertinent to this study.

Audiogram 57

Date 11/20/51 Time 2:00 P.M.

Name Subject 8 Test Clinic

	Inside Room	Outside
Temperature		29° F.
Relative Humidity		60%
Barometric Pressure		29.50 Falling
Wind		S 12



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

2

2

Subject 8

2. Test Scores

Psychological Examination

Q. Score 9

L. Score 5

T. Score 7

Cooperative Reading Test

V. Score 8

R. Score 8

C. Score 10

T. Score 9

3. Scholastic Standing

2.81

Subject 8 was above average on the psychological examination with a total score in the seventh decile or the fourth ten per cent of the norm group. He was above average on the cooperative reading test with a total score in the ninth decile or the second highest ten per cent of the norm group.

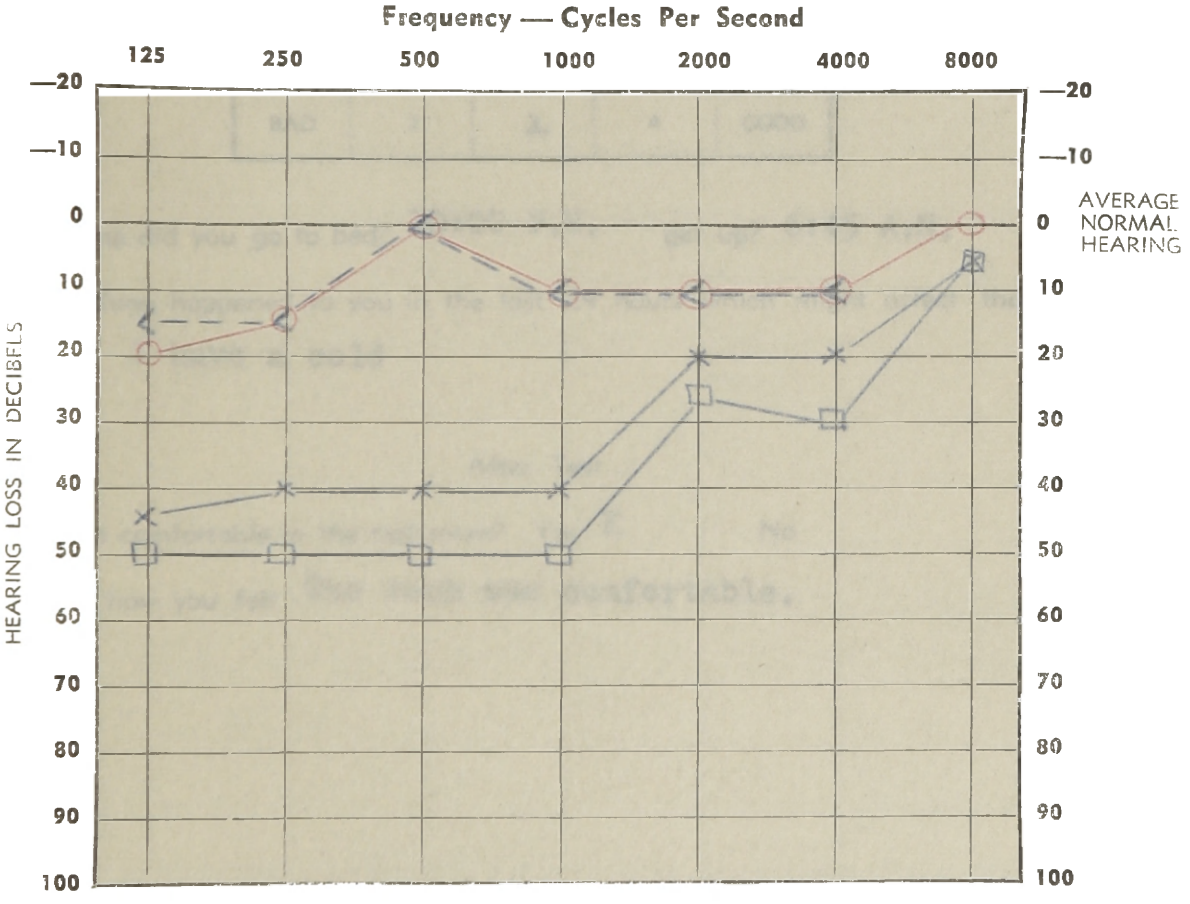
His grades were between C and B.

Audiogram 58

Date 4/11/52 Time 2:30 P.M.

Name Subject 8 Test 1

	Inside Room	Outside
Temperature	70° F.	37° F.
Relative Humidity	50%	57%
Barometric Pressure	29.55 Falling	29.42 Falling
Wind		ENE 17



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	4/11/52	Time	2:30 P.M.
Name	Subject 8	Test	1
	Before Test		After Test
Pulse	80		76
Temperature	97.8°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I have a cold.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:00 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? I have a cold

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. The room was comfortable.

8. Comments by operator: Consistent threshold at each frequency, air conduction. Inconsistent threshold at each frequency, bone conduction. Signal lights: No delay.

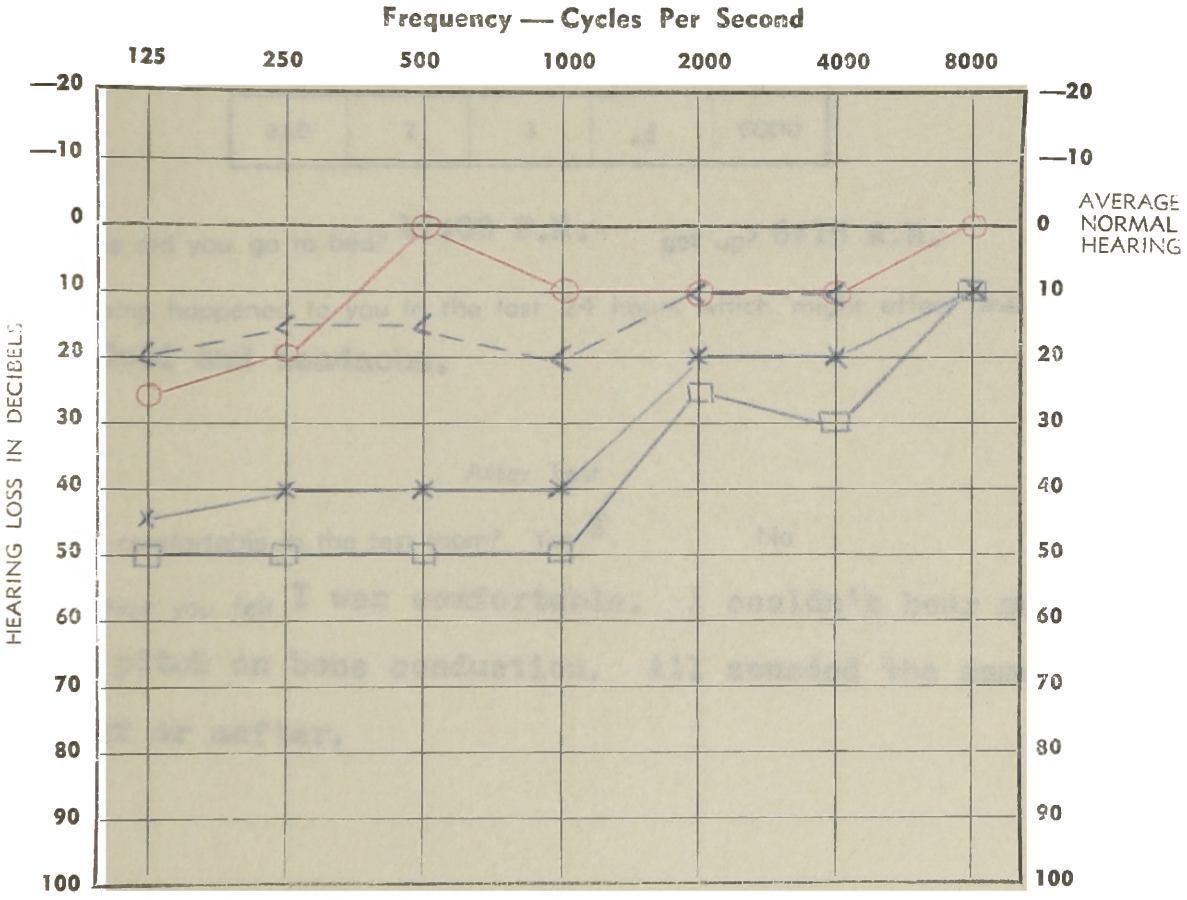
Questionnaire 50

Audiogram 59

Date 4/15/52 Time 11:45 A.M.

Name Subject 8 Test 2

	Inside Room	Outside
Temperature	70° F.	46° F.
Relative Humidity	65%	76% Raining
Barometric Pressure	29.20 Rising	29.03 Rising
		Wind NNW 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	4/15/52	Time	11:45 A.M.
Name	Subject 8	Test	2
	Before Test		After Test
Pulse	72		72
Temperature	98.2°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. My cold is still bothering me. Makes my head seem full, left side in particular. Have dull headache.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 6:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Cold and headache.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was comfortable. I couldn't hear much change in pitch on bone conduction. All sounded the same, just louder or softer.

8. Comments by operator: Consistent threshold at each frequency, air conduction. Signal lights: 8 to 12 seconds delay on bone conduction.

Questionnaire 51

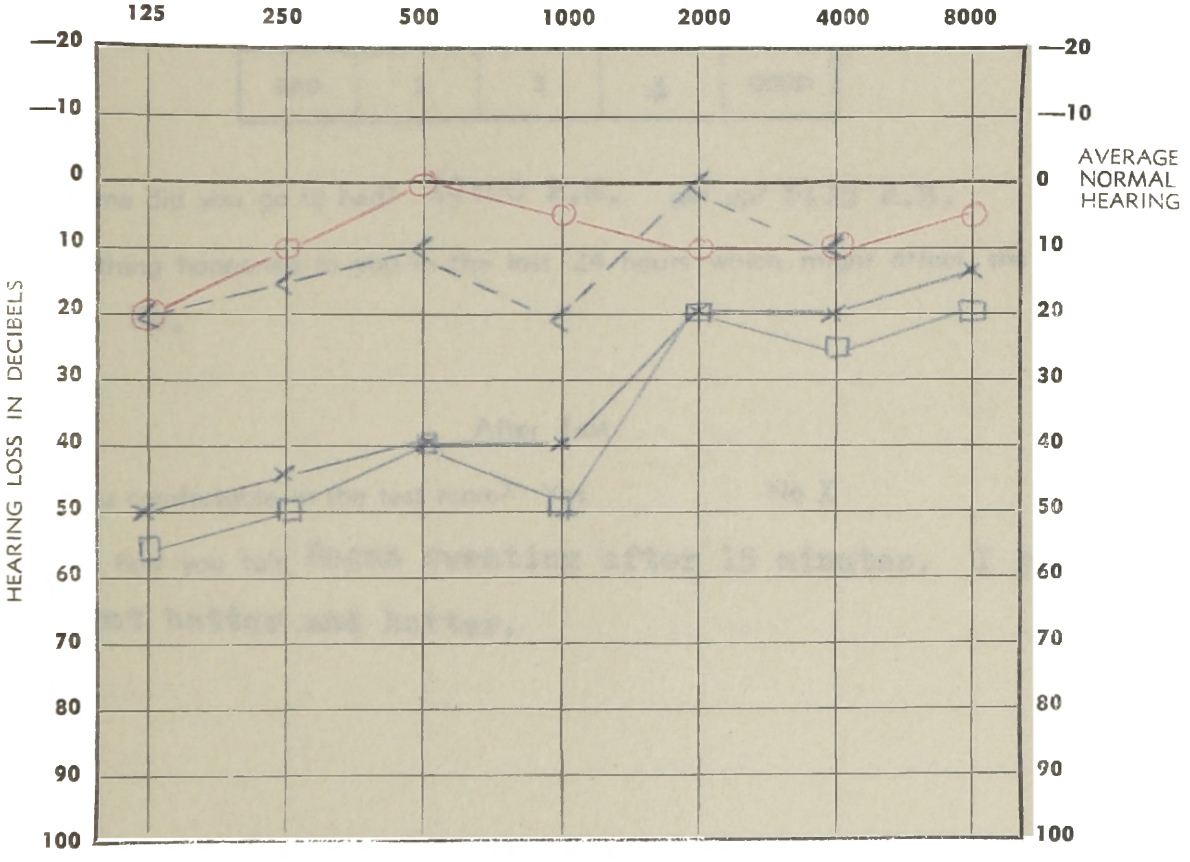
Audiogram 60

Date 4/18/52 Time 11:00 A.M.

Name Subject 8 Test 3

	Inside Room	Outside
Temperature	90° F.	66° F.
Relative Humidity	65%	71%
Barometric Pressure	29.40 Falling	29.19 Falling
		Wind WSW 12

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	4/18/52	Time	11:00 A.M.
Name	Subject 8	Test	3
	Before Test		After Test
Pulse	86		80
Temperature	98°		98.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel lazy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:00 P.M. get up? 6:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Began sweating after 15 minutes. I just seem to get hotter and hotter.

8. Comments by operator: Signal lights: 12 to 15 seconds delay.

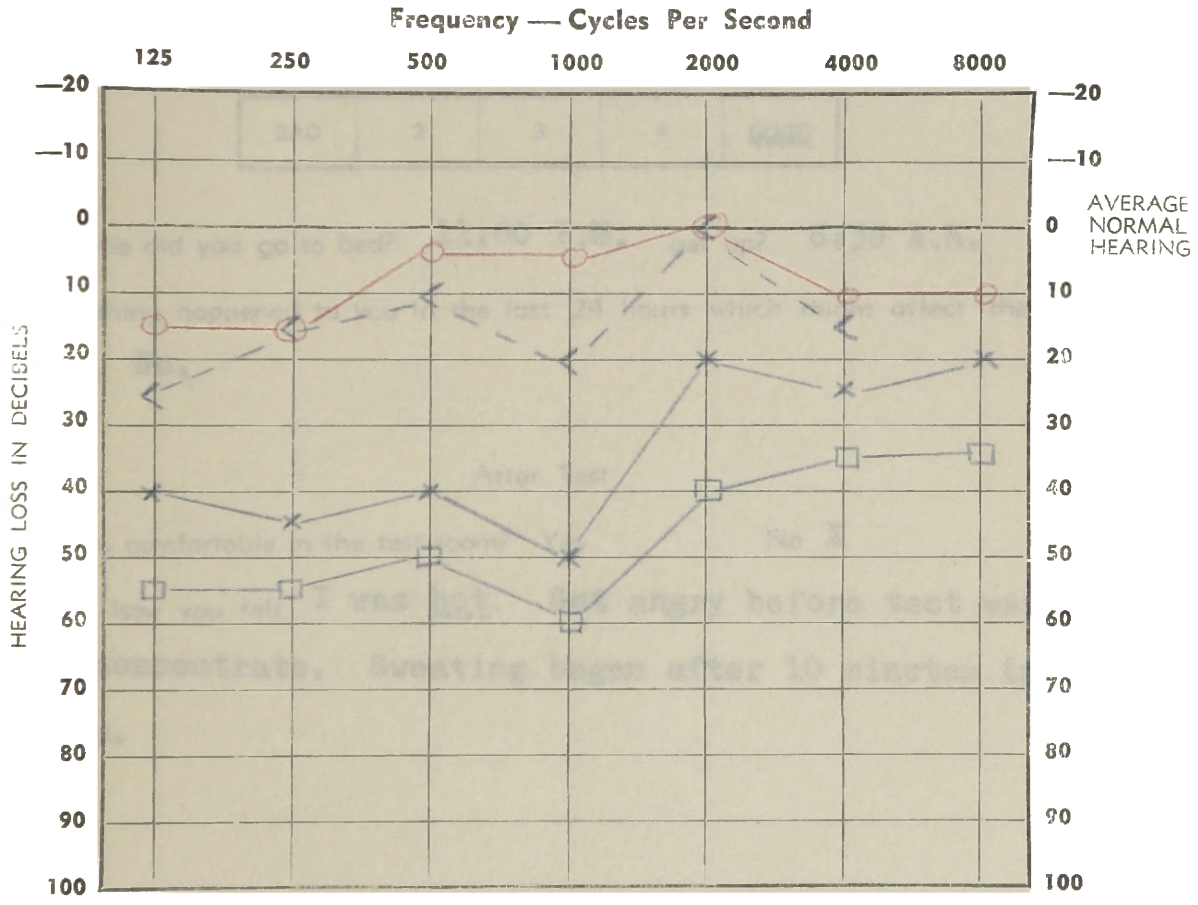
Questionnaire 52

Audiogram 61

Date 4/29/52 Time 4:15 P.M.

Name Subject 8 Test 4

	Inside Room	Outside
Temperature	90° F.	75° F.
Relative Humidity	80%	37%
Barometric Pressure	29.26 Steady	29.08 Steady
Wind		NNE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	4/29/52	Time	4:15 P.M.
Name	Subject 8	Test	4
	Before Test		After Test
Pulse	84		96
Temperature	98.6°		99°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feelalive and alert.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 6:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was hot. Got angry before test was over. Hard to concentrate. Sweating began after 10 minutes in test room.

8. Comments by operator: Profuse sweating Restless during waiting period. Inconsistent threshold at 2000, 4000 and 8000 cycles, air conduction, both ears. Signal lights: 12 to 13 seconds delay. See Medical History.

Questionnaire 53

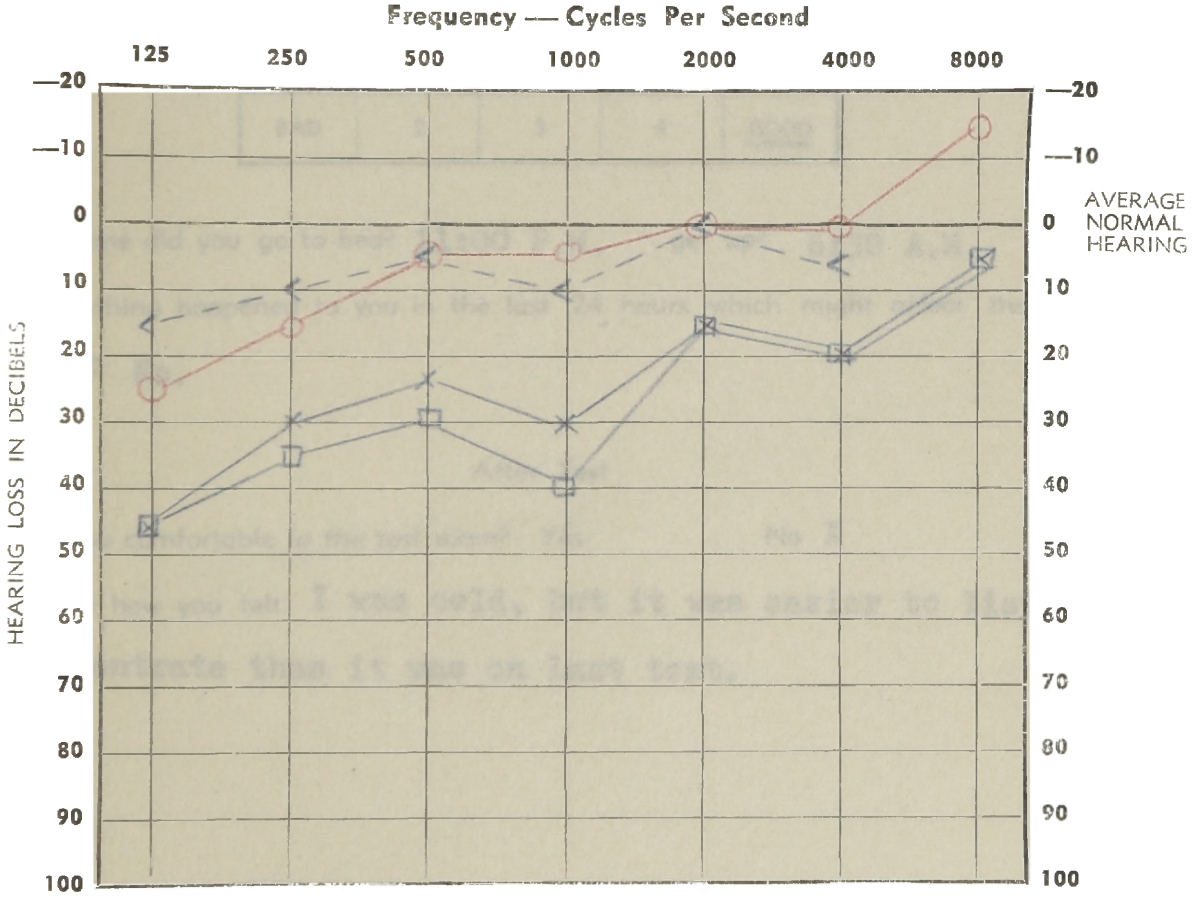
Audiogram 62

Date 5/2/52 Time 1:00 P.M.

Name Subject 8 Test 5

	Inside Room	Outside
Temperature	50° F.	61° F.
Relative Humidity	70%	36%
Barometric Pressure	29.27 Steady	29.07 Steady

Wind NNW 14



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	5/2/52	Time	1:00 P.M.
Name	Subject 8	Test	5
	Before Test		After Test
Pulse	68		72
Temperature	98.6°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. I feel good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
				X

4. What time did you go to bed? 11:00 P.M. get up? 6:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was cold, but it was easier to listen and concentrate than it was on last test.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: 3 to 5 seconds delay. See Medical History.

Questionnaire 54

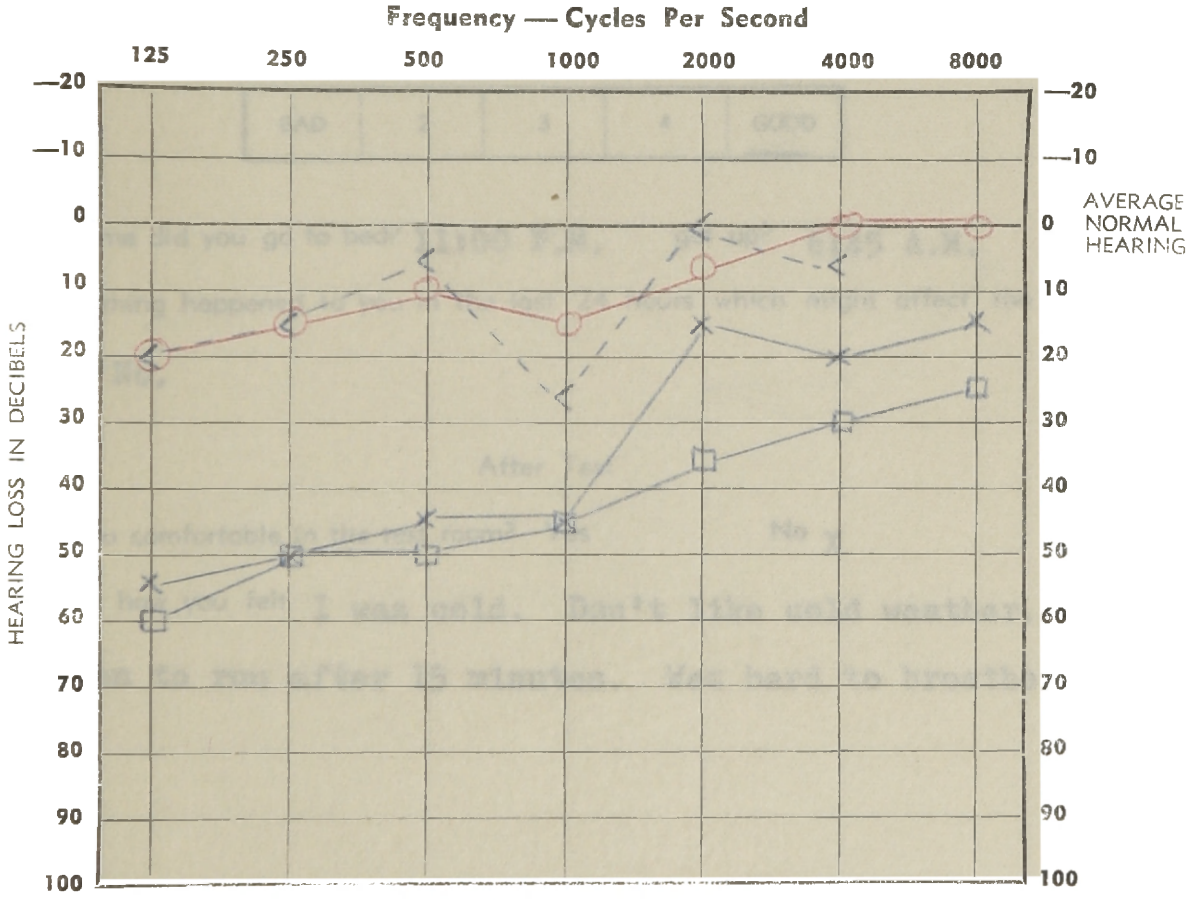
Audiogram 63

Date 5/6/52 Time 4:15 P.M.

Name Subject 8 Test 6

	Inside Room	Outside
Temperature	20° F.	62° F.
Relative Humidity	80%	43%
Barometric Pressure	29.24 Rising	28.99 Rising

Wind W 30



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	5/6/62	Time	4:15 P.M.
Name	Subject 8	Test	6
	Before Test		After Test
Pulse	74		68
Temperature	98.6°		97.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was cold. Don't like cold weather. Nose began to run after 15 minutes. Was hard to breathe.

8. Comments by operator: Mouth breathing after 10 minutes in test room. Inconsistent threshold at 4000 and 8000 cycles, air conduction, left ear. Signal lights: 12 to 18 second delay. See Medical History.

Questionnaire 55

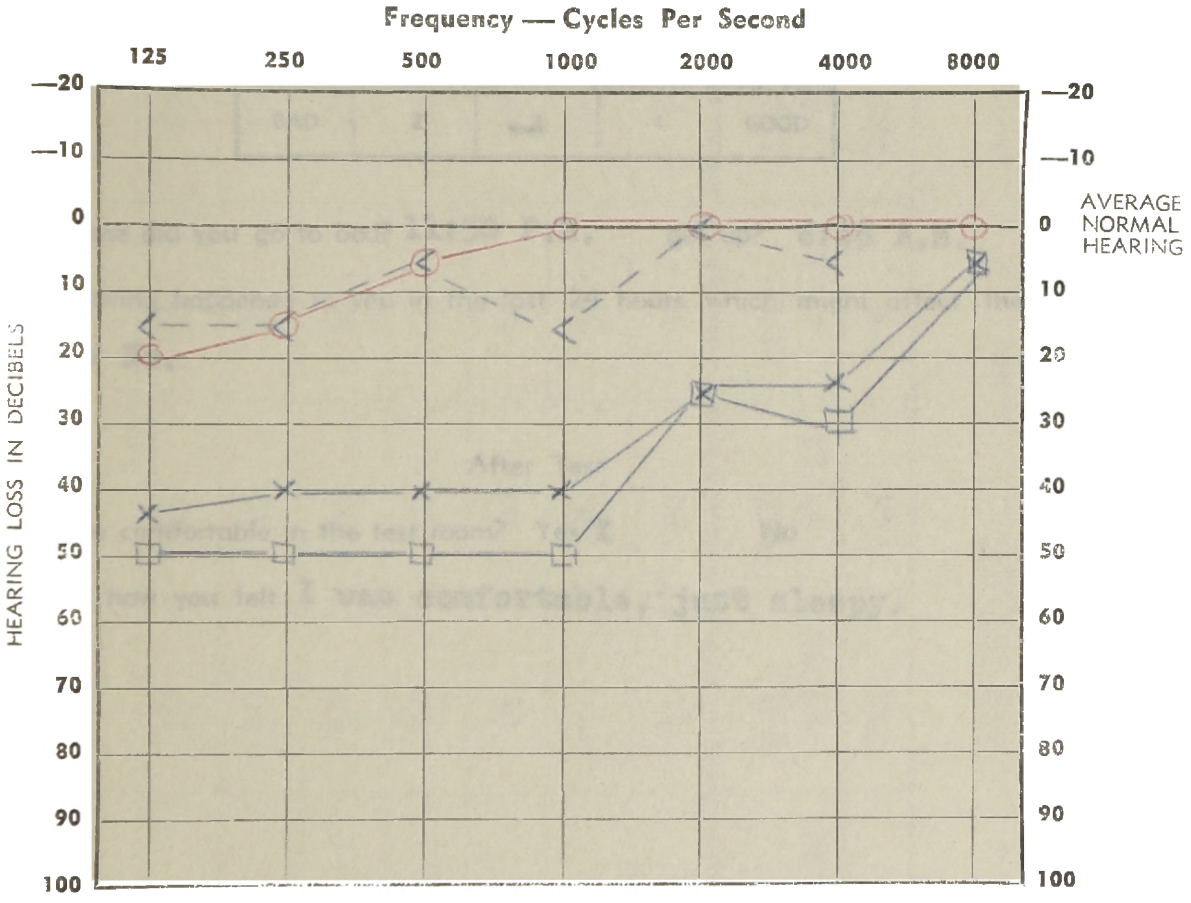
Audiogram 64

Date 5/13/52 Time 4:15 P.M.

Name Subject 8 Test 7

	Inside Room	Outside
Temperature	70° F.	64° F.
Relative Humidity	50%	36%
Barometric Pressure	29.01 Rising	28.92 Rising

Wind W 20



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

2

Date	5/13/52	Time	4:15 P.M.
Name	Subject 8	Test	7
	Before Test		After Test
Pulse	76		78
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was comfortable, just sleepy.

8. Comments by operator: Consistent threshold at each frequency except 2000, 4000 and 8000 cycles, air conduction, right ear.

Questionnaire 56

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	50	50	55	55	45	60	50	15
250	50	50	50	55	35	50	50	15
500	50	50	40	50	30	50	50	20
1000	50	50	50	60	40	45	50	20
2000	25	25	20	40	15	35	25	25
4000	30	30	25	35	20	30	30	15
8000	5	10	20	35	5	25	5	30
Loss in db $\leq$ Loss Ave. Loss	260 37.14	265 37.86	260 37.14	330 47.14	190 27.14	295 42.15	260 37.14	140 20.00
Rank	2nd	5th	2nd	7th	1st	6th	2nd	

Maximum Deviation of 140 (20.00) Decibels

Between 50° 70% and 90° 80%

Subject 8

Left Ear with Masking

TABLE XV

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	45	45	50	40	45	55	45	15
250	40	40	45	45	30	50	40	20
500	40	40	40	40	25	45	40	20
1000	40	40	40	50	30	45	40	20
2000	20	20	20	20	15	15	25	10
4000	20	20	20	25	20	20	25	5
8000	5	10	15	20	5	15	5	15
Loss in db Σ Loss Ave. Loss	210 30.00	215 30.71	230 32.86	240 34.28	170 24.28	245 35.00	220 31.42	75 10.71
Rank	2nd	3rd	5th	6th	1st	7th	4th	

Maximum Deviation of 75 (10.71) Decibels Subject 8

Between 50° 70% and 20° 80% Left Ear without Masking

TABLE XVI

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	15	20	20	25	15	20	15	10
250	15	15	15	15	10	15	15	5
500	0	15	10	10	5	5	5	10
1000	10	20	20	20	10	25	15	15
2000	10	10	0	0	0	0	0	10
4000	10	10	10	15	5	5	5	10
8000								
Loss in db Σ Loss Ave. Loss	60 10.00	90 15.00	75 12.50	85 14.16	45 7.50	70 11.66	55 9.16	45 7.50
Rank	3rd	7th	5th	6th	1st	4th	2nd	

Maximum Deviation of 45 (7.50) Decibels Subject 8

Between 50° 70% and 70° 65% Left Ear Bone Conduction

TABLE XVII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	20	25	20	15	25	20	20	10
250	15	20	10	15	15	15	15	10
500	0	0	0	5	5	10	5	10
1000	10	10	5	5	5	15	0	15
2000	10	10	10	0	0	5	0	10
4000	10	10	10	10	0	0	0	10
8000	0	0	5	10	- 5	0	0	15
Loss in db ≤ Loss Ave. Loss	65 9.28	75 10.71	60 8.57	60 8.57	45 6.42	65 9.28	40 5.71	35 5.00
Rank	5th	7th	3rd	3rd	2nd	5th	1st	

Maximum Deviation of 35 (5.00) Decibels Subject 8

Between 70° 50% and 70° 65% Right Ear

TABLE XVIII

Subject 9

1. Medical Findings

a. Physical Examination

Age: 18

Height: 68"

Weight: 138

Heart and lungs: Negative

Blood pressure: 120/70

Chest X-Ray: Negative

Extremities: Normal

Tonsils removed

Perforated right ear drum

b. Laboratory Examination

Urinalysis: Negative

Red blood count: 5,160,000

Hemoglobin: 100% 16.6 mgm. per 100 cc.

White blood count: 6,000

c. Oto-rhinolaryngeal Examination

History: Otitis media in childhood with deafness in right ear. No infection since.

Examination:

Throat: Tonsils removed

Nasopharynx: Negative

Nose: Negative

Ears: Large posterior perforation right tympanum. Middle ear dry. Old healed perforation left.

Advice: No treatment

Diagnosis: Perforation right tympanum. Obstructive deafness right.

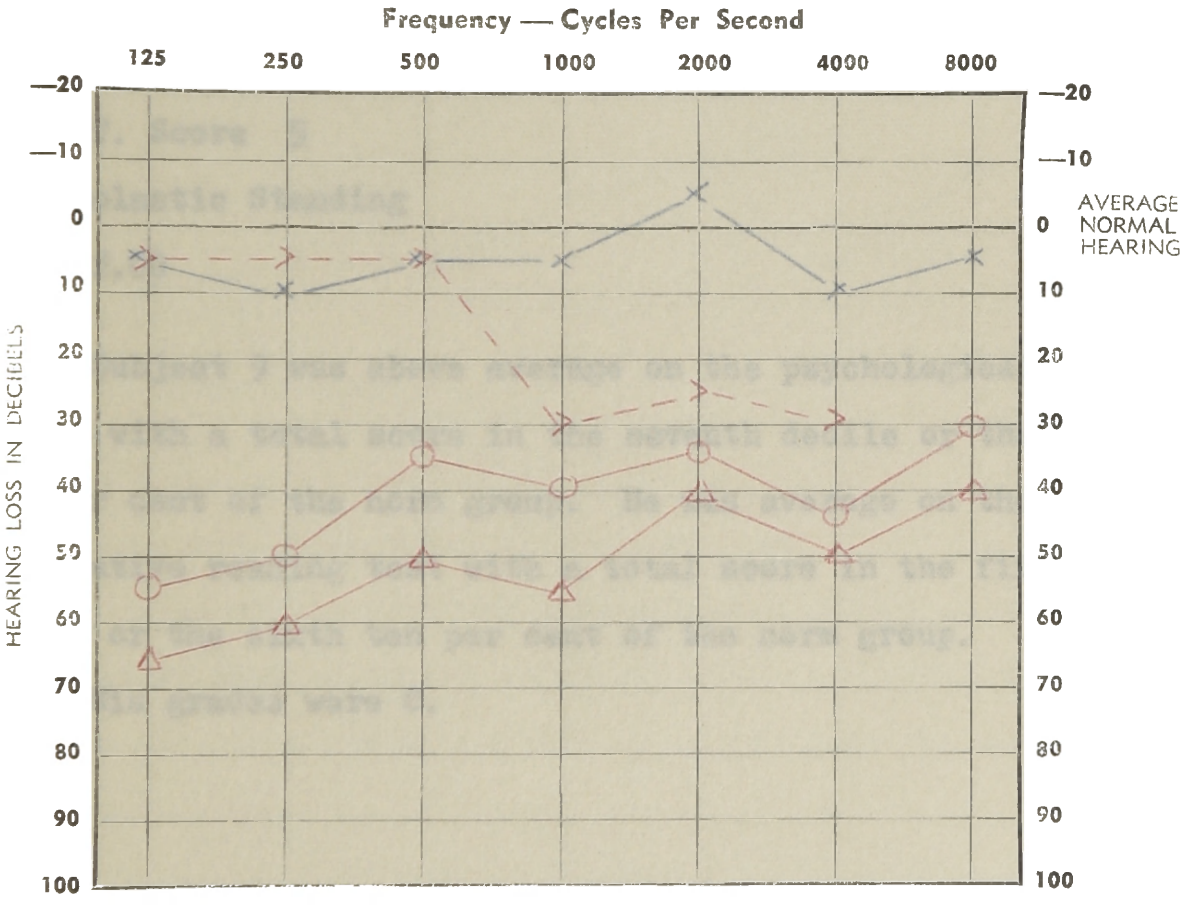
With the exception of the oto-rhinolaryngeal diagnosis of obstructive deafness right from perforation right tympanum and old healed perforation left, the medical findings were negative or within normal limits and revealed nothing pertinent to this study.

Audiogram 65

Date 11/19/51 Time 10:00 A.M.

Name Subject 9 Test Clinic

	Inside Room	Outside
Temperature		22° F
Relative Humidity		81%
Barometric Pressure		29.35 Rising
		Wind W 14



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

2

Bone Conduction

> Right Ear with masking at

< Left Ear with masking at

2

Subject 9

2. Test Scores

Psychological Examination

Q. Score 9

L. Score 5

T. Score 7

Cooperative Reading Test

V. Score 3

R. Score 5

C. Score 7

T. Score 5

3. Scholastic Standing

2.00

Subject 9 was above average on the psychological examination with a total score in the seventh decile or the fourth ten per cent of the norm group. He was average on the cooperative reading test with a total score in the fifth decile or the sixth ten per cent of the norm group.

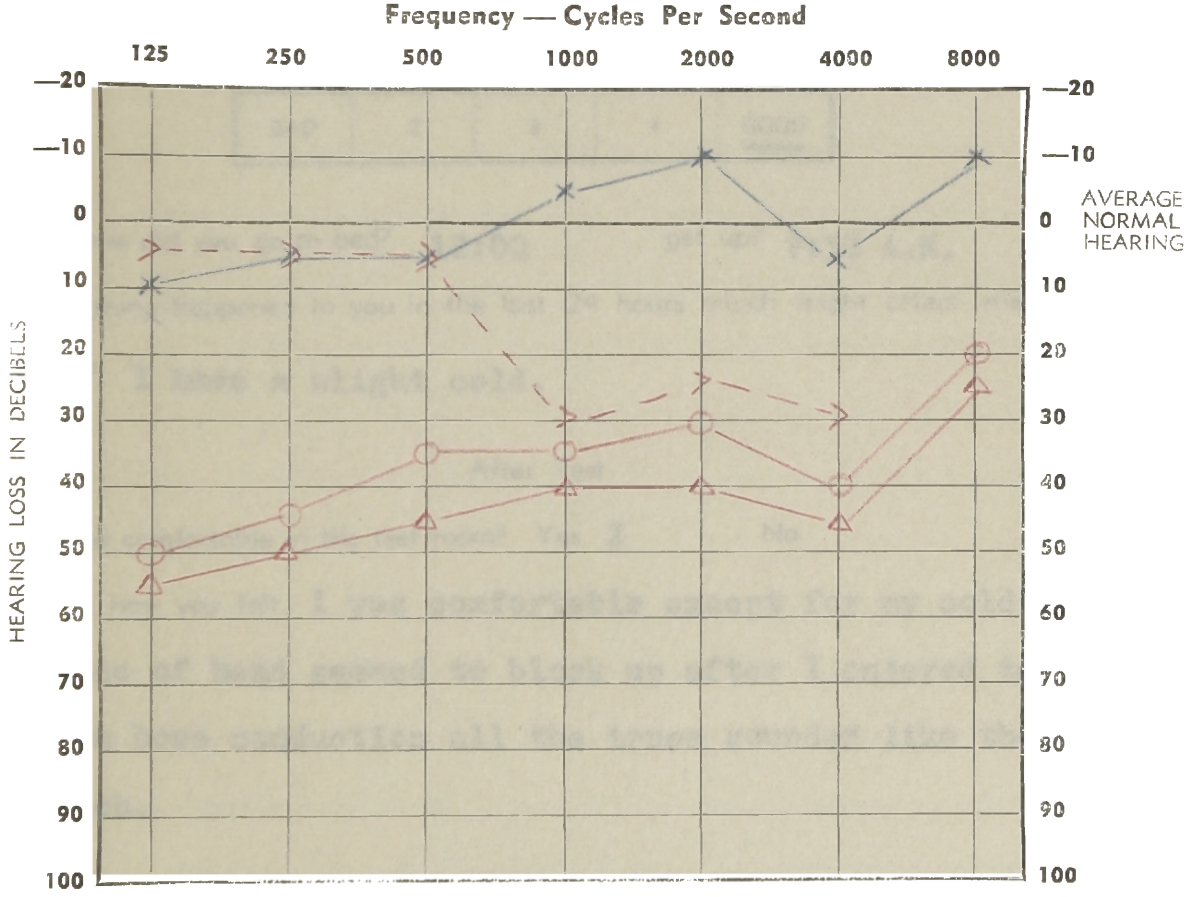
His grades were C.

Audiogram 66

Date 4/10/52 Time 11:00 A.M.

Name Subject 9 Test 1

	Inside Room	Outside
Temperature	70° F.	33° F.
Relative Humidity	50%	95% Raining
Barometric Pressure	29.20 Rising	28.97 Rising
		Wind WNW 22



Air Conduction

O Right Ear

X Left Ear

with masking 2

△ Right Ear at

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	4/10/52	Time	11:00 A.M.
Name	Subject 9	Test	1
	Before Test		After Test
Pulse	64		64
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel good and relaxed.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? I have a slight cold.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was comfortable except for my cold. Right side of head seemed to block up after I entered test room. On bone conduction all the tones sounded like the same pitch.

8. Comments by operator: Consistent threshold at each frequency except on bone conduction. Signal lights: No delay.

Questionnaire 57

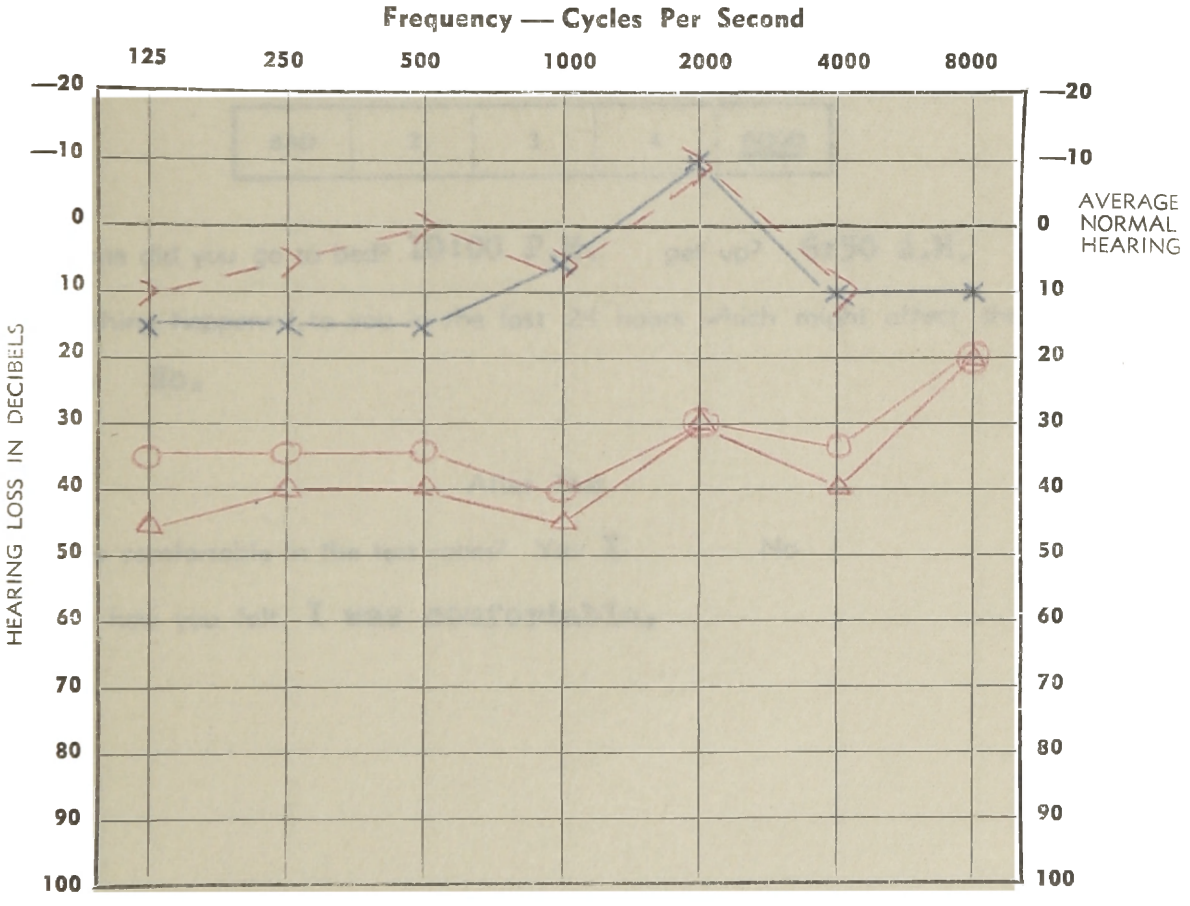
Audiogram 67

Date 4/15/52 Time 3:15 P.M.

Name Subject 9 Test 2

	Inside Room	Outside
Temperature	70° F.	51° F.
Relative Humidity	65%	42%
Barometric Pressure	29.20 Rising	29.12 Rising

Wind N 30



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

[> Right Ear with masking at 2

<] Left Ear with masking at

Date	4/15/52	Time	3:15 P.M.
Name	Subject 9	Test	2
	Before Test		After Test
Pulse	64		68
Temperature	97.8°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Just a little tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:00 P.M. get up? 6:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was comfortable.

8. Comments by operator: Consistent threshold at each frequency except 1000 and 2000 cycles, left ear, air conduction. Signal lights: No delay.

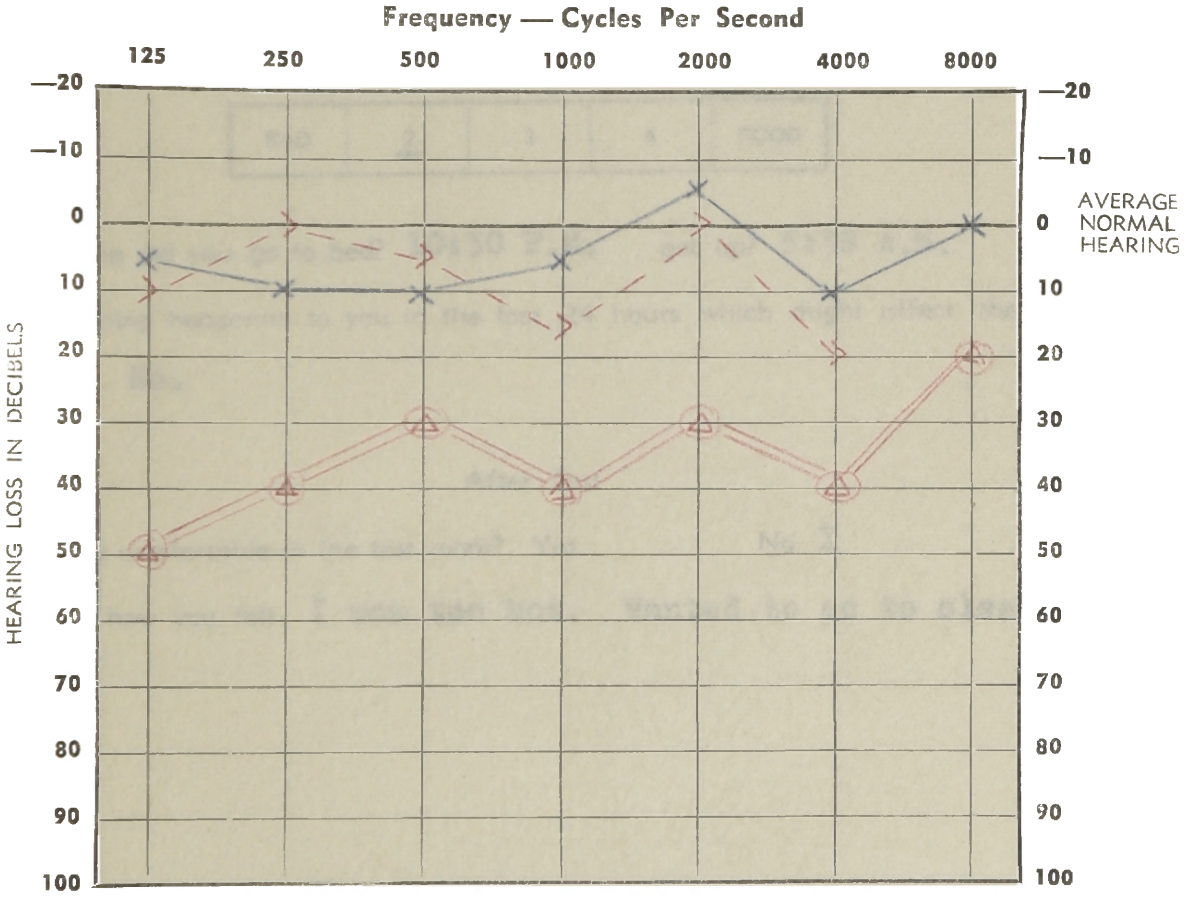
Questionnaire 58

Audiogram 68

Date 4/22/52 Time 3:00 P.M.

Name Subject 9 Test 3

	Inside Room	Outside
Temperature	90° F.	62° F.
Relative Humidity	65%	79% Raining
Barometric Pressure	29.21 Steady	29.00 Steady
Wind		SSW 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2 & 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2 & 3

<| Left Ear with masking at

Date	4/22/52	Time	3:00 P.M.
Name	Subject 9	Test	3
	Before Test		After Test
Pulse	68		76
Temperature	97.8°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. A little tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 6:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was too hot. Wanted to go to sleep.

8. Comments by operator: No change in air conduction with and without masking at 2. Rechecked at 3. No change. Signal lights: 4 to 6 seconds delay.

Questionnaire 59

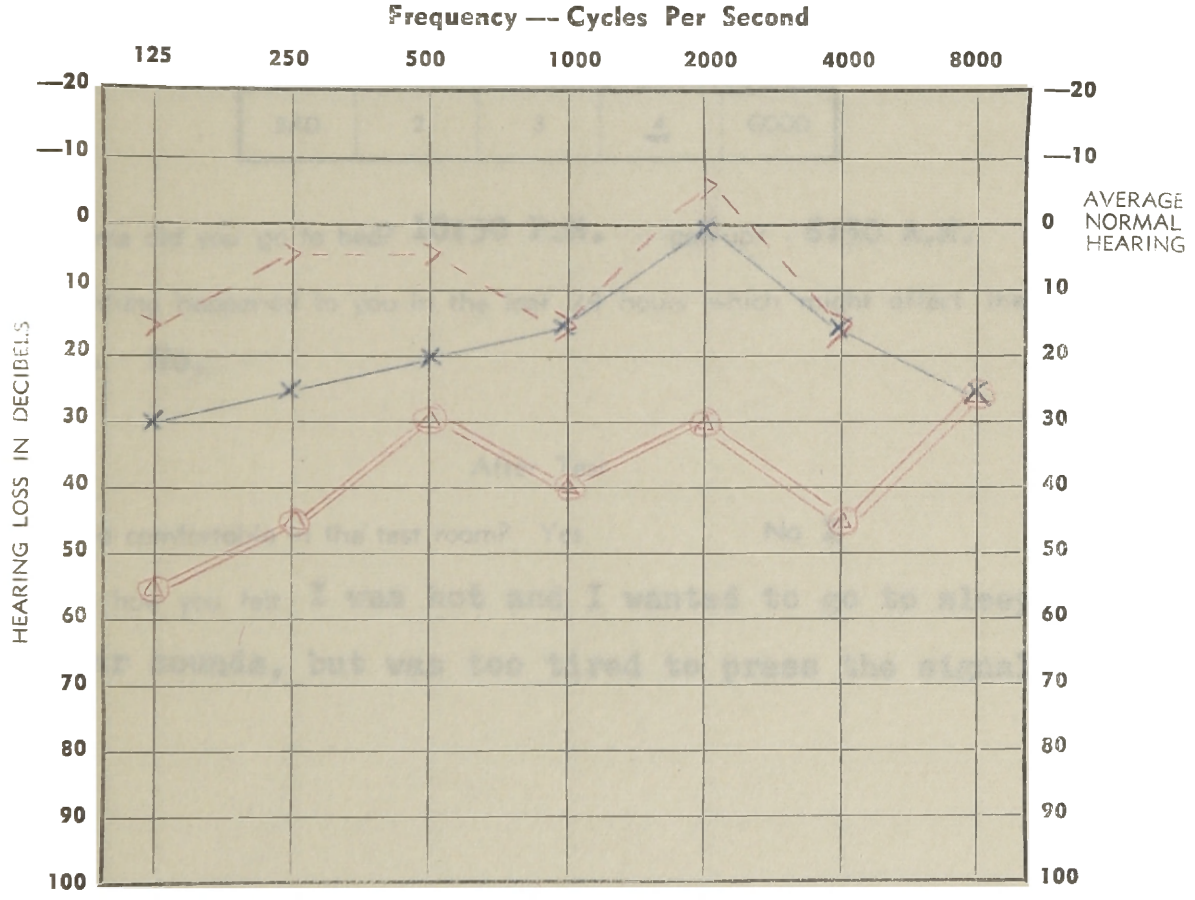
Audiogram 69

Date 4/29/52 Time 1:45 P.M.

Name Subject 9 Test 4

	Inside Room	Outside
Temperature	90° F.	74° F.
Relative Humidity	80%	37%
Barometric Pressure	29.26 Steady	29.08 Steady

Wind NNE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2 & 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2 & 3

<| Left Ear with masking at

Date	4/29/52	Time	1:45 P.M.
Name	Subject 9	Test	4
	Before Test		After Test
Pulse	74		80
Temperature	97.8°		98.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel pretty good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 6:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was hot and I wanted to go to sleep. Could hear sounds, but was too tired to press the signal button.

8. Comments by operator: Consistent threshold at each frequency, right ear with and without masking. Rechecked at masking 3. Subject fell asleep during left ear test. Intensity dial raised to 60 db to arouse him. Signal lights: 8 to 10 seconds delay on right ear.

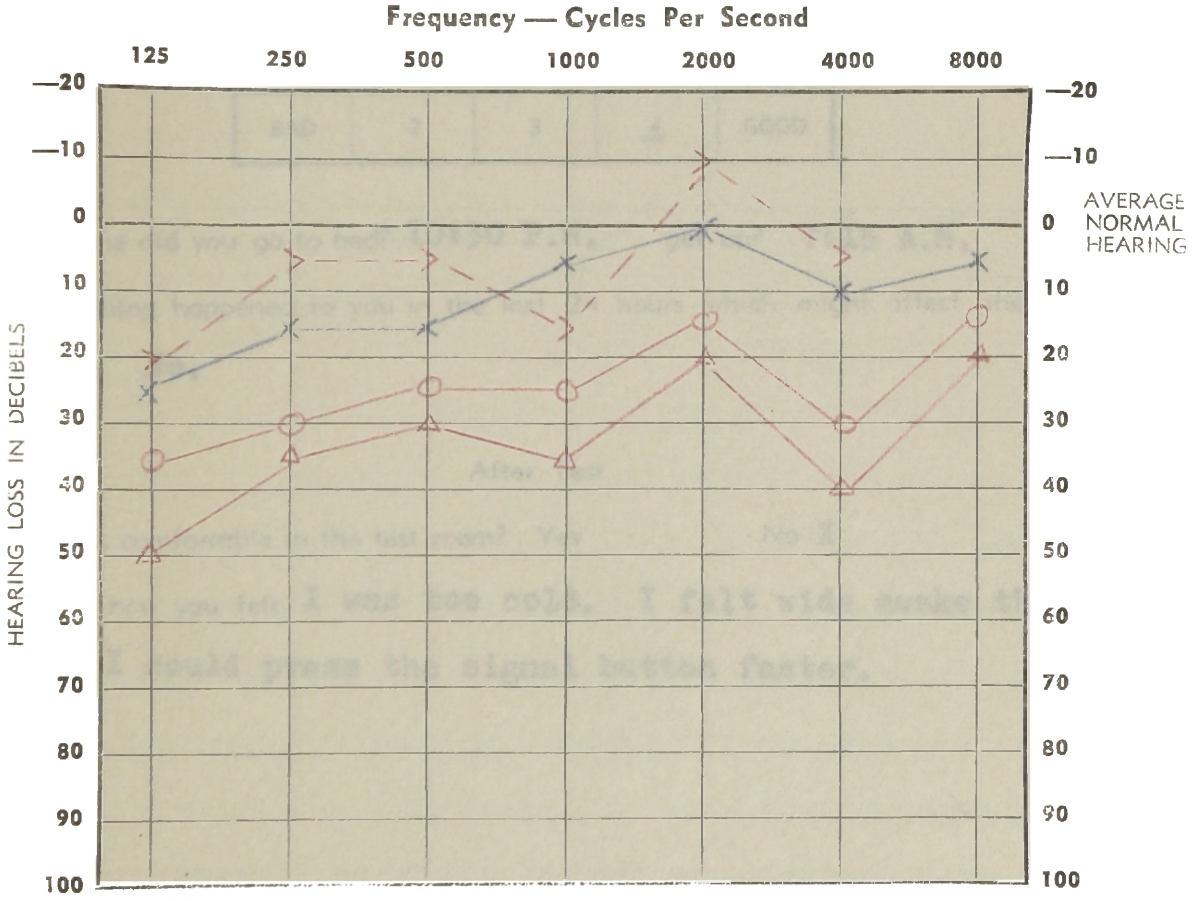
Questionnaire 60

Audiogram 70

Date 5/1/52 Time 2:00 P.M.

Name Subject 9 Test 5

	Inside Room	Outside
Temperature	50° F.	80° F.
Relative Humidity	70%	35%
Barometric Pressure	29.07 Falling	28.96 Falling
		Wind WSW 11



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

> Right Ear with masking at 2

< Left Ear with masking at

Date	5/1/52	Time	2:00 P.M.
Name	Subject 9	Test	5
	Before Test		After Test
Pulse	66		66
Temperature	98.6°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was too cold. I felt wide awake this time and I could press the signal button faster.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

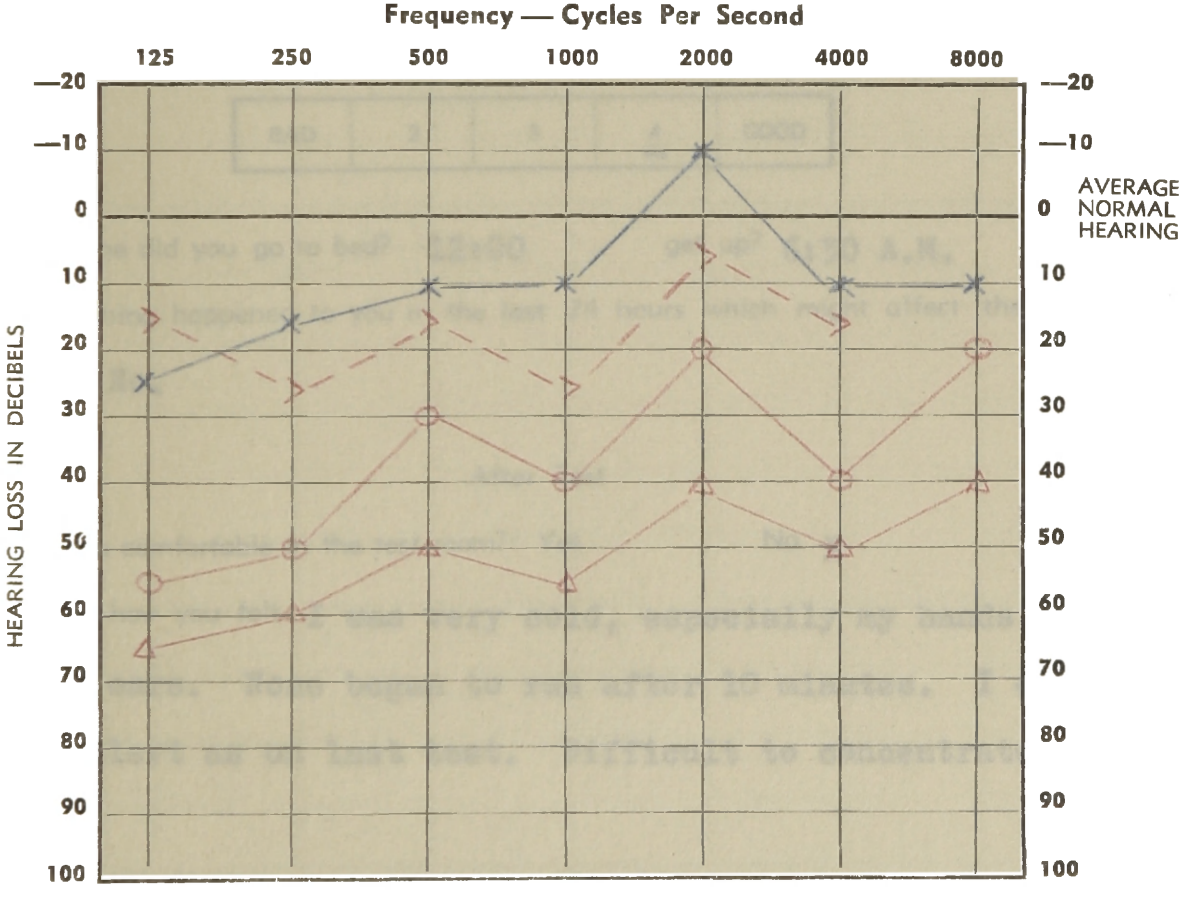
Questionnaire 61

Audiogram 71

Date 5/6/52 Time 11:00 A.M.

Name Subject 9 Test 6

	Inside Room	Outside
Temperature	20° F.	65° F.
Relative Humidity	80%	43%
Barometric Pressure	29.12 Rising	28.99 Rising
Wind	W 30	



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	5/6/52	Time	11:00 A.M.
Name	Subject 9	Test	6
	Before Test		After Test
Pulse	74		64
Temperature	98.6°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel fine today.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 6:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was very cold, especially my hands, foet, nose and ears. Nose began to run after 10 minutes. I didn't feel as alert as on last test. Difficult to concentrate.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: 3 to 7 seconds delay.

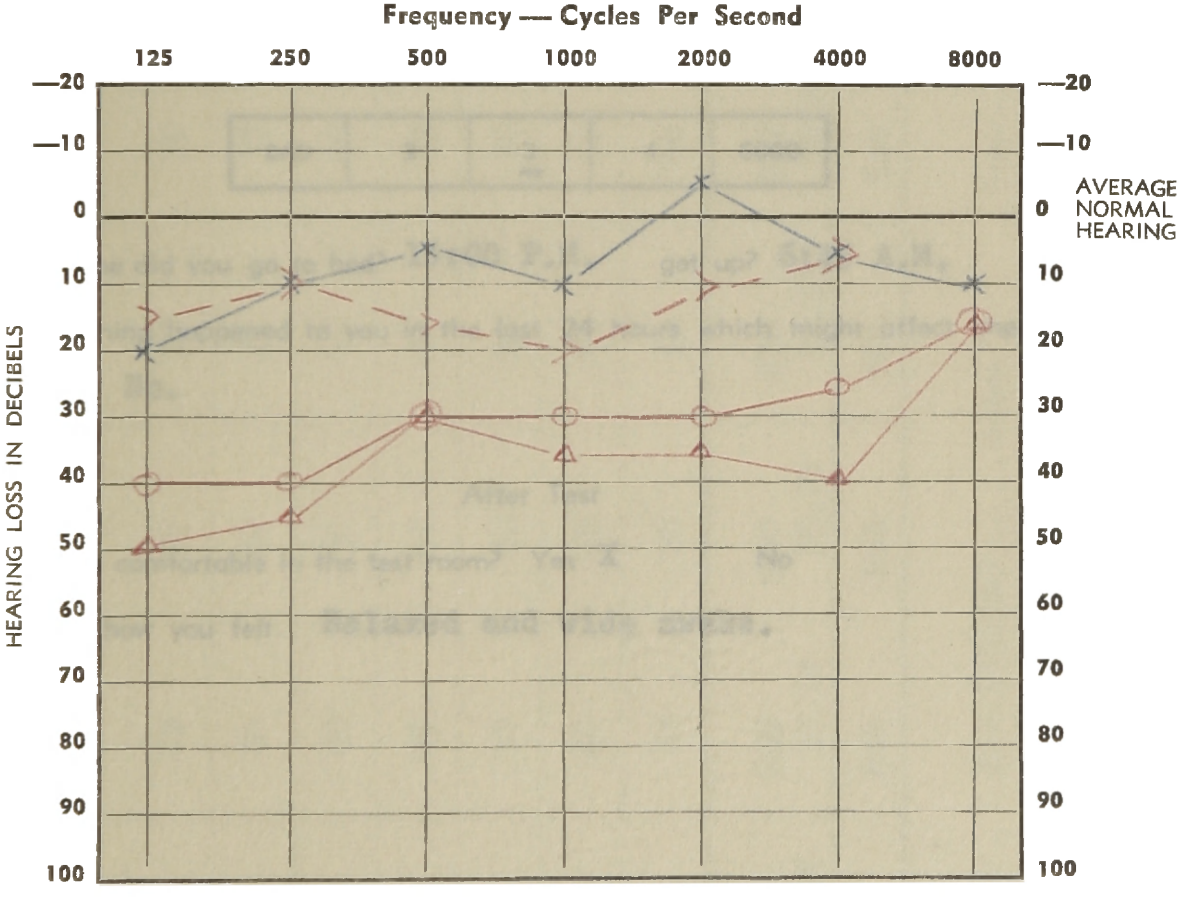
Questionnaire 62

Audiogram 72

Date 5/13/52 Time 3:00 P.M.

Name Subject 9 Test 7

	Inside Room	Outside
Temperature	70° F.	64° F.
Relative Humidity	50%	36%
Barometric Pressure	29.01 Rising	28.92 Rising
Wind		W 20



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	5/13/52	Time	3:00 P.M.
Name	Subject 9	Test	7
	Before Test		After Test
Pulse	80		76
Temperature	97.8°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. I feel good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		X		

4. What time did you go to bed? 10:00 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Relaxed and wide awake.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Questionnaire 63

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	55	45	50	55	50	65	50	20
250	50	40	40	45	35	60	45	25
500	45	40	30	30	30	50	30	20
1000	40	45	40	40	35	55	35	20
2000	40	30	30	30	20	40	35	20
4000	45	40	40	45	40	50	40	10
8000	25	20	20	25	20	40	15	25
Loss in db Σ Loss Ave. Loss	300 42.86	260 37.14	250 35.71	270 38.57	230 32.86	360 51.42	250 35.71	130 18.56
Rank	6th	4th	2nd	5th	1st	7th	2nd	

Maximum Deviation of 130 (18.56) Decibels Subject 9

Between 50° 70% and 20° 80% Right Ear with Masking

TABLE XIX

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	50	35	50	55	35	55	40	20
250	45	35	40	45	30	50	40	20
500	35	35	30	30	25	30	30	10
1000	35	40	40	40	25	40	30	15
2000	30	30	30	30	15	20	30	15
4000	40	35	40	45	30	40	25	20
8000	20	20	20	25	15	20	15	10
Loss in db Σ Loss Ave. Loss	255 36.42	230 32.86	250 35.71	270 38.57	175 25.00	255 36.42	210 30.00	95 13.57
Rank	5th	3rd	4th	7th	1st	5th	2nd	

Maximum Deviation of 95 (13.57) Decibels Subject 9

Between 50° 70% and 90° 80% Right Ear without Masking

TABLE XX

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	5	10	10	15	20	15	15	15
250	5	5	0	5	5	25	10	25
500	5	0	5	5	5	15	[illegible]	15
1000	30	5	15	15	15	25	20	25
2000	25	-10	0	- 5	-10	5	10	35
4000	30	10	20	15	5	15	5	25
8000								
Loss in db Σ Loss Ave. Loss	100 16.66	20 3.33	50 8.33	50 8.33	40 6.66	100 16.66	75 12.50	80 13.33
Rank	7th	1st	3rd	3rd	2nd	7th	5th	

Maximum Deviation of 80 (13.33) Decibels Subject 9

Between 70° 65% and {20° 80% / 70° 50%}

Right Ear Bone Conduction

TABLE XXI

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	10	15	5	30	25	25	20	25
250	5	15	10	25	15	15	10	20
500	5	15	10	20	15	10	5	15
1000	- 5	5	5	15	5	10	10	20
2000	-10	-10	- 5	0	0	-10	- 5	10
4000	5	10	10	15	10	10	5	10
8000	10	10	0	25	5	10	10	25
Loss in db ≶ Loss Ave. Loss	20 2.86	60 8.57	35 5.00	130 18.57	75 10.71	70 10.71	55 7.86	110 15.71
Rank	1st	4th	2nd	7th	5th	5th	3rd	

Maximum Deviation of 110 (15.71) Decibels Subject 9

Between 70° 50% and 90° 80% Left Ear

TABLE XXII

Subject 10

1. Medical Findings

a. Physical Examination

Age: 24

Height: 74"

Weight: 190

Mastoidectomy right at age of 5 years

Tonsils removed

Heart and lungs: Normal

Blood pressure: 130/88

Abdomen: Negative

Extremities: Normal except for left dislocated patella.

b. Laboratory Examination

Red blood count: 4,940,000

Hemoglobin: 96%

Urinalysis: Negative

White blood count: 7900

c. Oto-rhinolaryngeal Examination

History: Mastoidectomy right at age of 5 years. Two years ago drainage from right ear cleared by streptomycin.

Examination:

Throat: Tonsils removed

Nose: Negative

Ears: Cerumen left. Left tympanum retracted and scarred. Right tympanum dull and thick. Mastoid scar right.

Advice: No treatment

Diagnosis: Obstructive low tone deafness right

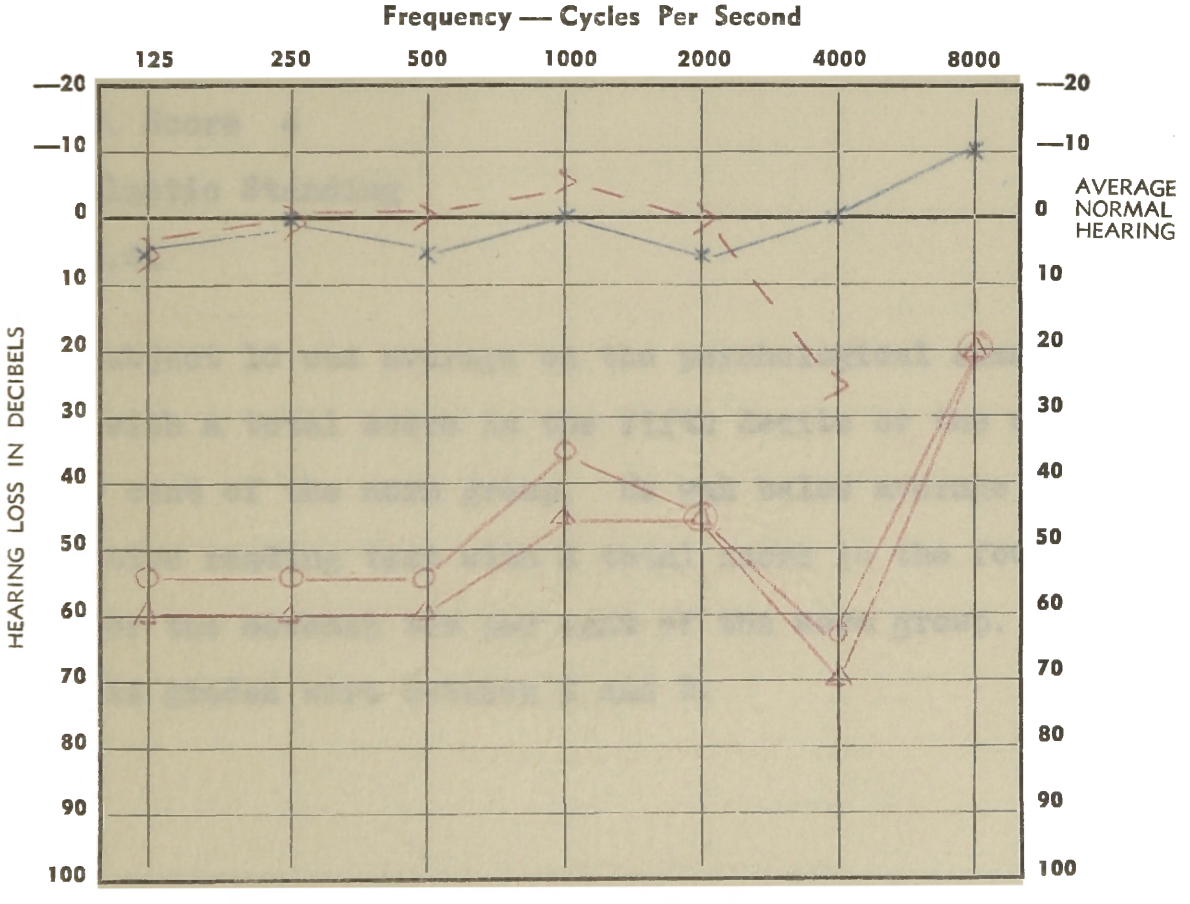
With the exception of the oto-rhinolaryngeal diagnosis of obstructive low tone deafness right from a mastoidectomy, the medical findings revealed nothing pertinent to this study.

Audiogram 73

Date 11/11/51 Time 1:00 P.M.

Name Subject 10 Test Clinic

	Inside Room	Outside
Temperature		42° F.
Relative Humidity		72%
Barometric Pressure		29.32
Wind		ESE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Subject 10

2. Test Scores

Psychological Examination

Q. Score 7

L. Score 4

T. Score 5

Cooperative Reading Test

V. Score 5

R. Score 3

C. Score 7

T. Score 4

3. Scholastic Standing

2.41

Subject 10 was average on the psychological examination with a total score in the fifth decile or the sixth ten per cent of the norm group. He was below average on the cooperative reading test with a total score in the fourth decile or the seventh ten per cent of the norm group.

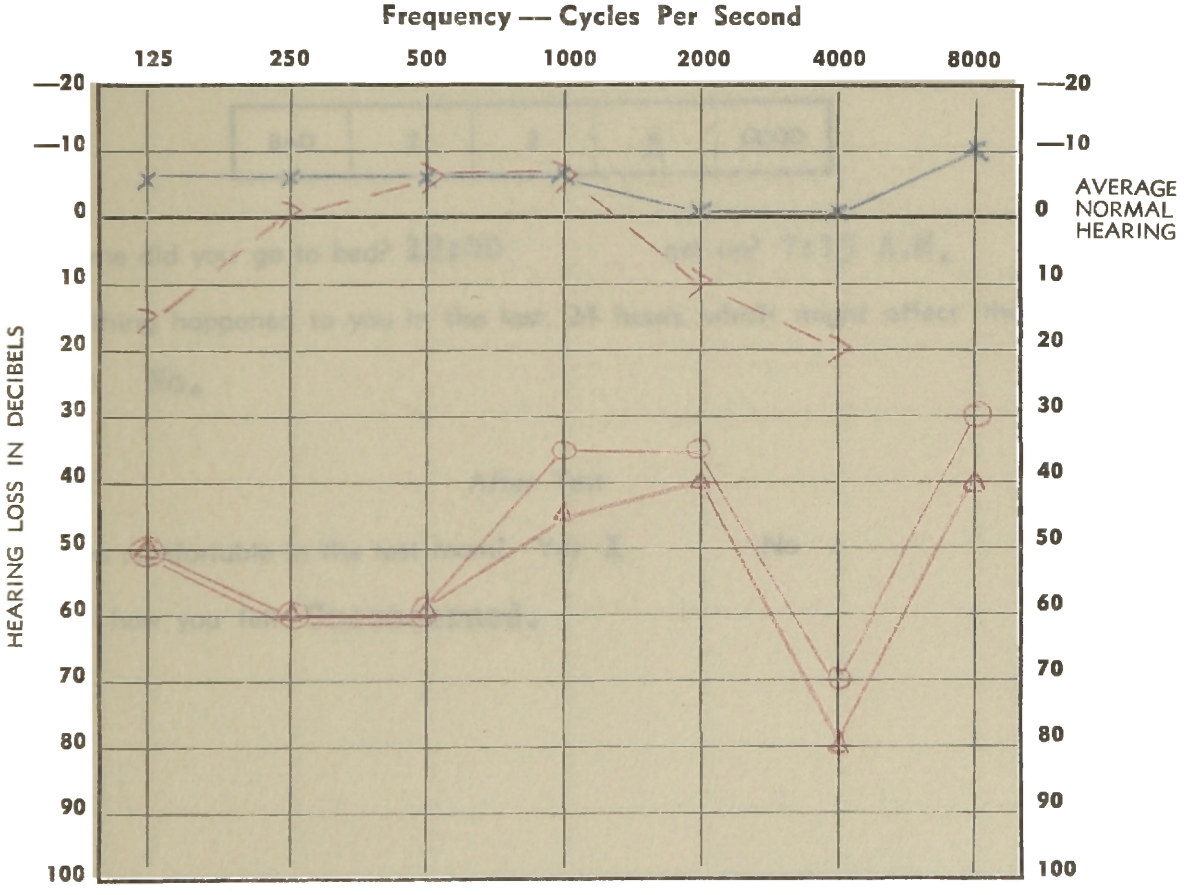
His grades were between C and B.

Audiogram 74

Date 4/10/52 Time 4:00 P.M.

Name Subject 10 Test 1

	Inside Room	Outside
Temperature	70° F.	32° F.
Relative Humidity	50%	84% Raining
Barometric Pressure	29.40 Rising	29.17 Rising
		Wind WNW 22



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/10/52	Time	4:00 P.M.
Name	Subject 10	Test	1
	Before Test		After Test
Pulse	80		70
Temperature	98.2°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good. Carefree.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Unconcerned.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay. Subject seemed relaxed during waiting period.

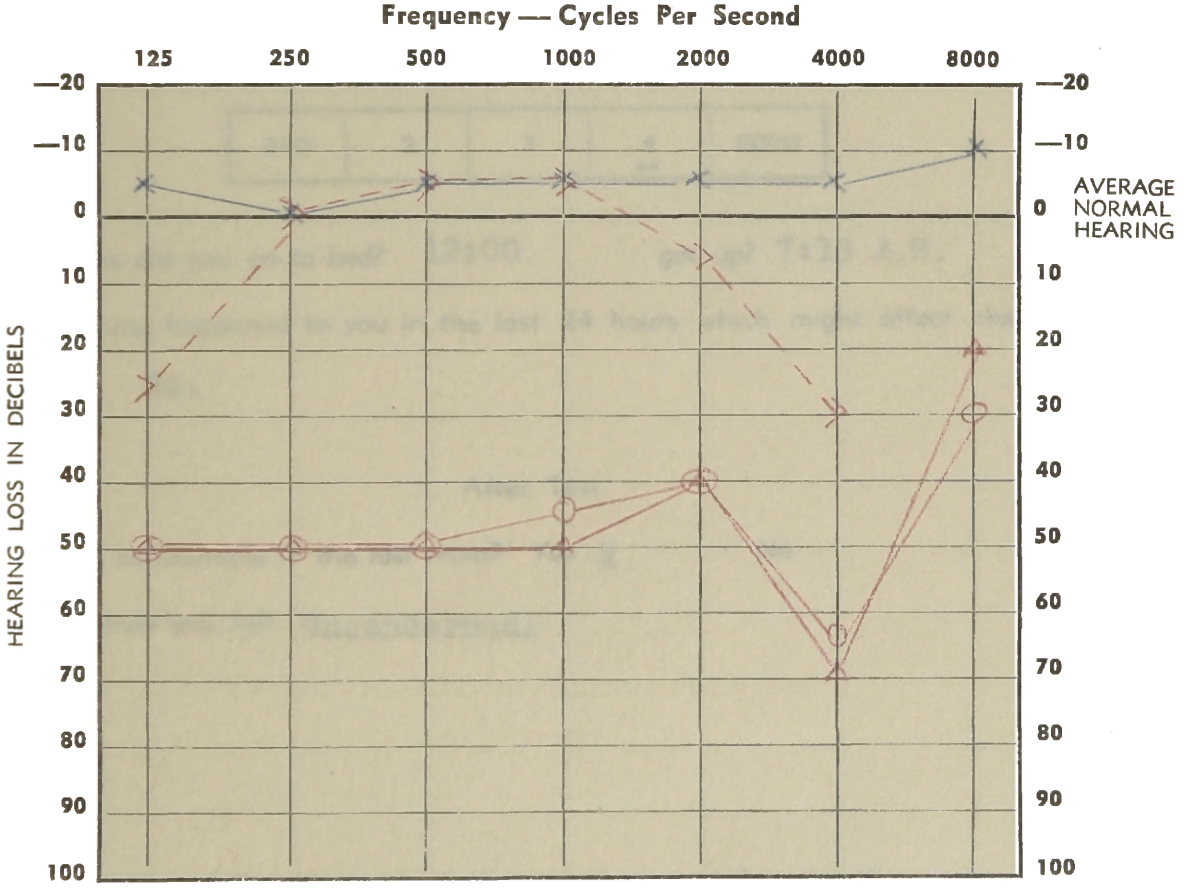
Questionnaire 64

Audiogram 75

Date 4/15/52 Time 4:00 P.M.

Name Subject 10 Test 2

	Inside Room	Outside
Temperature	70° F.	51° F.
Relative Humidity	65%	42% Rain in A.M.
Barometric Pressure	29.35 Rising	29.12 Rising
Wind		N 30



Air Conduction

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at _____ 3

□ Left Ear at

Bone Conduction - - - - - -

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/15/52	Time	4:00 P.M.
Name	Subject 10	Test	2
	Before Test		After Test
Pulse	82		78
Temperature	98.4°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Just a little tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Unconcerned.

8. Comments by operator: Consistent threshold at each frequency except 1000 cycles, right ear on bone conduction. Signal lights: No delay. Subject seemed relaxed in test room.

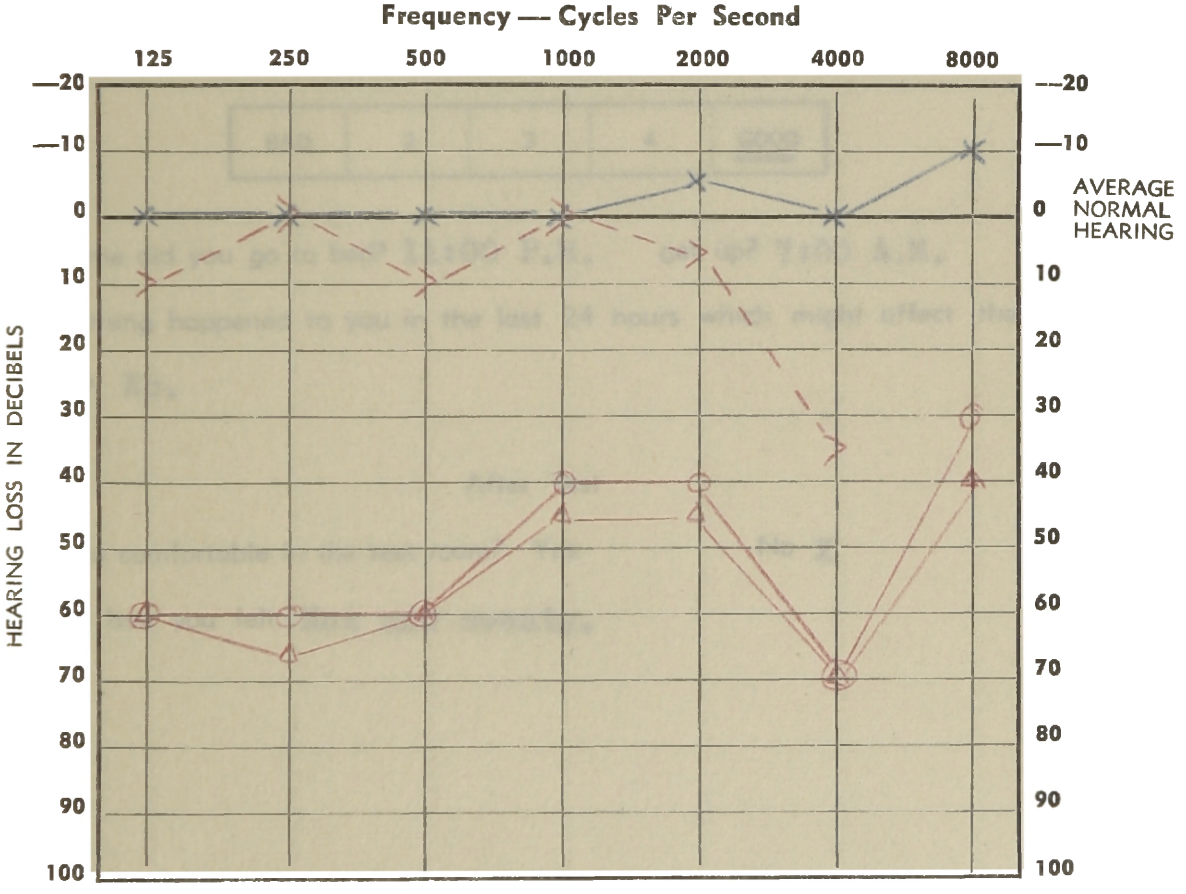
Questionnaire 65

Audiogram 76

Date 4/22/52 Time 4:00 P.M.

Name Subject 10 Test 3

	Inside Room	Outside
Temperature	90° F.	64° F.
Relative Humidity	65%	79% Raining
Barometric Pressure	29.21 Steady	29.00
		Wind SSW 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/22/52	Time	4:00 P.M.
Name	Subject 10	Test	3
	Before Test		After Test
Pulse	82		90
Temperature	98.6°		99°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Energetic.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Not and sweaty.

8. Comments by operator: Profuse sweating. Consistent threshold at each frequency except 125 cycles with and without masking, air conduction. Signal lights: 4 to 8 seconds delay.

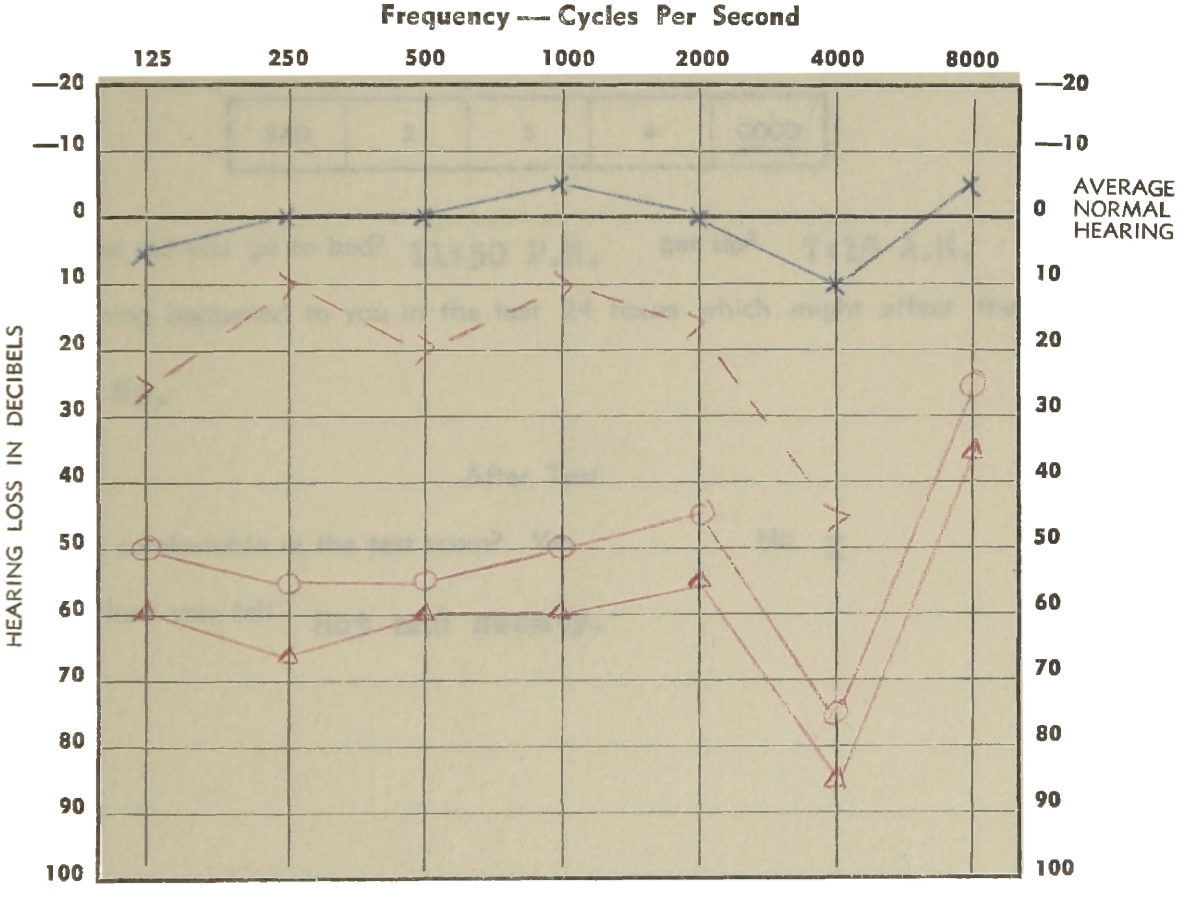
Questionnaire 66

Audiogram 77

Date 4/29/52 Time 1:00 P.M.

Name Subject 10 Test 4

	Inside Room	Outside
Temperature	90° F.	74° F.
Relative Humidity	80%	37%
Barometric Pressure	29.26 Steady	29.08 Steady
Wind		NNE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/29/52	Time	1:00 P.M.
Name	Subject 10	Test	4
	Before Test		After Test
Pulse	84		84
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Hot and sweaty.

8. Comments by operator: Profuse sweating. Signal lights: 5 to 8 seconds delay.

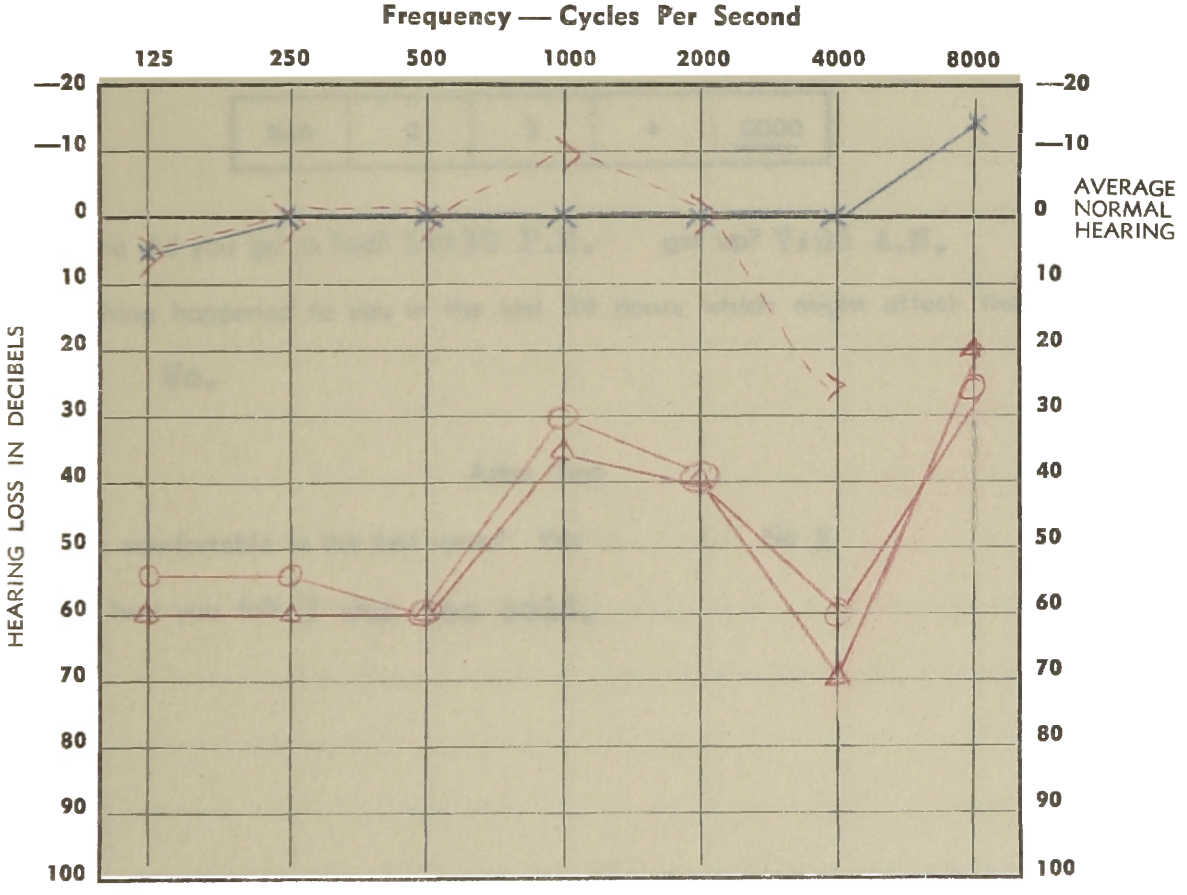
Questionnaire 67

Audiogram 78

Date 5/1/52 Time 4:00 P.M.

Name Subject 10 Test 5

	Inside Room	Outside
Temperature	50° F.	80° F.
Relative Humidity	70%	35%
Barometric Pressure	29.22 Falling	28.96 Falling
Wind		WSW 11



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	5/1/52	Time	4:00 P.M.
Name	Subject 10	Test	5
	Before Test		After Test
Pulse	78		78
Temperature	98.8°		98.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was too cold.

8. Comments by operator: Consistent threshold at each frequency except 8000 cycles, right ear with and without masking, air conduction. Signal lights: No delay.

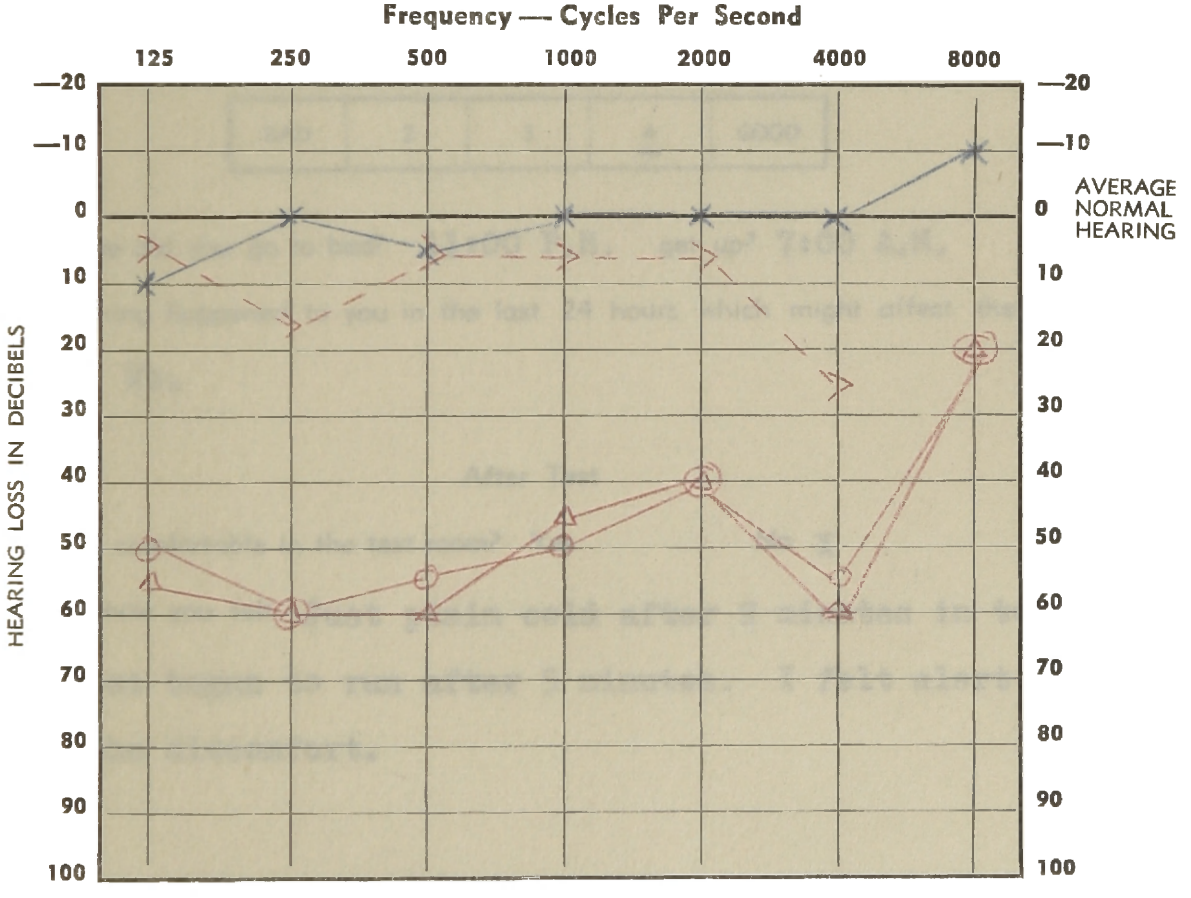
Questionnaire 68

Audiogram 79

Date 5/8/52 Time 4:00 P.M.

Name Subject 10 Test 6

	Inside Room	Outside
Temperature	20° F.	59° F.
Relative Humidity	80%	55% Rain in A.M.
Barometric Pressure	29.20 Falling	29.04 Falling
Wind		NNE 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	5/8/52	Time	4:00 P.M.
Name	Subject 10	Test	6
	Before Test		After Test
Pulse	80		74
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Just plain cold after 2 minutes in test room. Nose began to run after 5 minutes. I felt alert despite the discomfort.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

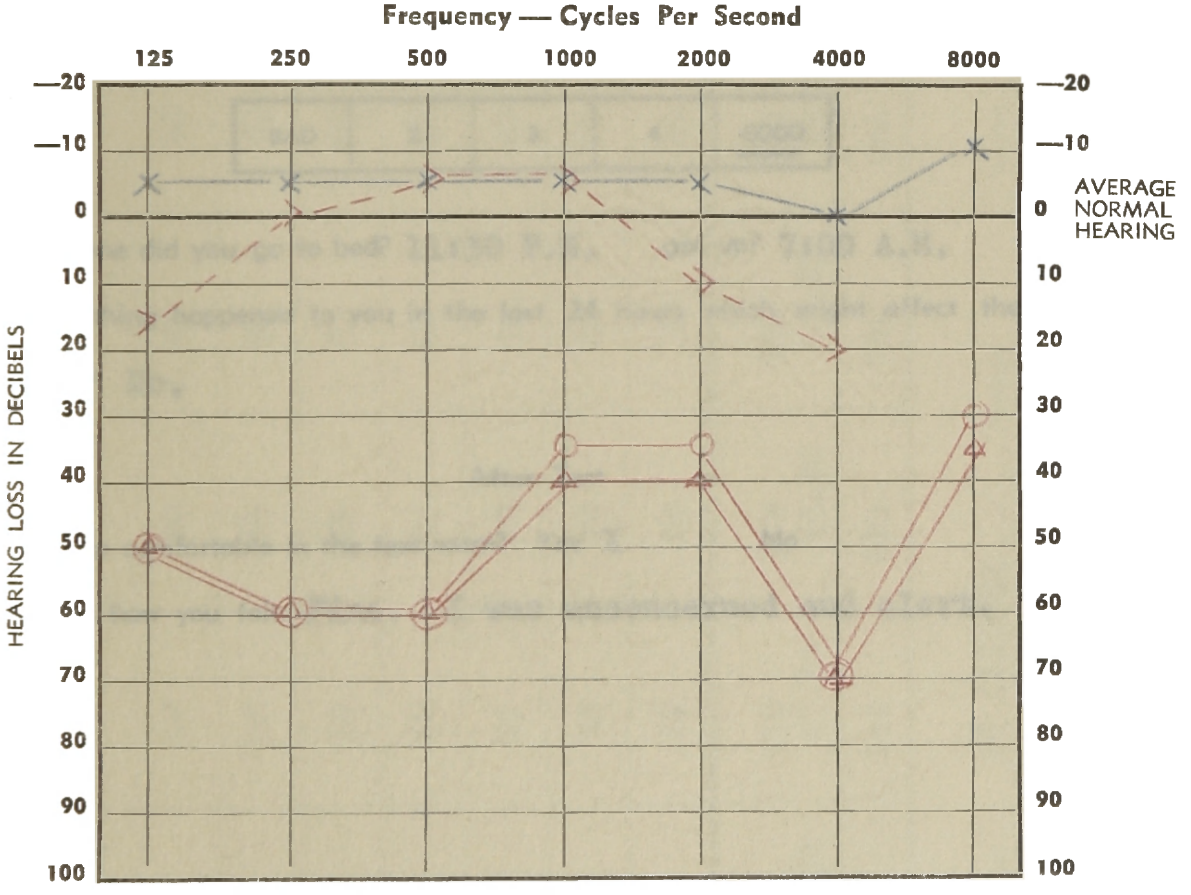
Questionnaire 69

Audiogram 80

Date 5/12/52 Time 5:00 P.M.

Name Subject 10 Test 7

	Inside Room	Outside
Temperature	70° F.	43° F.
Relative Humidity	50%	71% Raining
Barometric Pressure	28.90 Steady	28.70 Steady
Wind		W 22



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	5/12/52	Time	5:00 P.M.
Name	Subject 10	Test	7
	Before Test		After Test
Pulse	84		84
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Fine. I was unconcerned and alert.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay. Subject seemed relaxed in test room.

Questionnaire 70

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	50	50	60	60	60	55	50	10
250	60	50	65	65	60	60	60	15
500	60	50	60	60	60	60	60	10
1000	45	50	45	60	35	45	40	25
2000	40	40	45	55	40	40	40	15
4000	80	70	70	85	70	60	70	25
8000	40	20	40	35	20	20	35	20
Loss in db ≤ Loss Ave. Loss	375 53.57	330 47.14	385 55.00	420 60.00	345 49.28	340 48.57	355 50.71	90 12.86
Rank	5th	1st	6th	7th	3rd	2nd	4th	

Maximum Deviation of 90 (12.86) Decibels Subject 10

Between 70° 65% and 90° 80% Right Ear with Masking

TABLE XXIII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	50	50	60	50	55	50	50	10
250	60	50	60	55	55	60	60	10
500	60	50	60	55	60	55	60	10
1000	35	45	40	50	30	50	35	20
2000	35	40	40	45	40	40	35	10
4000	70	65	70	75	60	55	70	20
8000	30	30	30	25	25	20	30	10
Loss in db Σ Loss Ave. Loss	340 48.57	330 47.14	360 51.42	355 50.71	325 46.42	330 47.14	340 48.57	35 5.00
Rank	4th	2nd	7th	6th	1st	2nd	4th	

Maximum Deviation of 35 (5.00) Decibels Subject 10

Between 50° 70% and 90° 65% Right Ear without Masking

TABLE XXIV

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	15	25	10	25	5	5	15	20
250	0	0	0	10	0	15	0	15
500	- 5	- 5	10	20	0	5	- 5	25
1000	- 5	- 5	0	10	-10	5	- 5	20
2000	10	5	5	15	0	5	10	15
4000	20	30	35	45	25	25	20	25
8000								
Loss in db ≷ Loss Ave. Loss	35 5.83	50 8.33	60 10.00	125 20.83	20 3.33	60 10.00	35 5.83	105 17.50
Rank	2nd	4th	5th	7th	1st	5th	2nd	

Maximum Deviation of 105 (17.50) Decibels Subject 10

Between 50° 70% and 90° 80% Right Ear Bone Conduction

TABLE XXV

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	- 5	- 5	0	5	5	10	- 5	15
250	- 5	0	0	0	0	0	- 5	5
500	- 5	- 5	0	0	0	5	- 5	10
1000	- 5	- 5	0	- 5	0	0	- 5	5
2000	0	- 5	- 5	0	0	0	- 5	5
4000	0	- 5	0	10	0	0	0	15
8000	-10	-10	-10	- 5	-15	-10	-10	10
Loss in db ≤ Loss Ave. Loss	-30 - 4.28	-35 - 5.00	-15 - 2.14	5 .72	-10 - 1.42	5 .72	-35 - 5.00	40 5.71
Rank	3rd	1st	4th	7th	5th	7th	1st	

Maximum Deviation of 40 (5.71) Decibels

Between (70° 50% / 70° 65%) and (20° 80% / 90° 80%)

Subject 10

Left Ear

TABLE XXVI

Subject 11

1. Medical Findings

   a. Physical Examination

      Age: 22

      Height: 68"

      Weight: 145

      Head negative except for chronic discharging right ear.

      Heart and lungs: Negative

      Blood pressure: 130/95

      Abdomen and extremities normal

   b. Laboratory Examination

      Urinalysis:

         Specific gravity: 1.017

         Albumin and sugar: Negative

      Red blood count: 4,640,000

      Hemoglobin: 90%

      White blood count: 7,850

   c. Oto-rhinolaryngeal Examination

      History: Chronic draining right ear for 15 years. Aural polyp removed from right ear 13 years ago. No history of pain or dizziness.

      Examination:

         Throat: Tonsils removed

         Nose: Negative

Ears: Left tympanum negative. Right tympanum superior perforation with thick fetid drainage.

Advice: Patient is having right ear treated

Diagnosis: Chronic suppurative otitis media right. Obstructive deafness right.

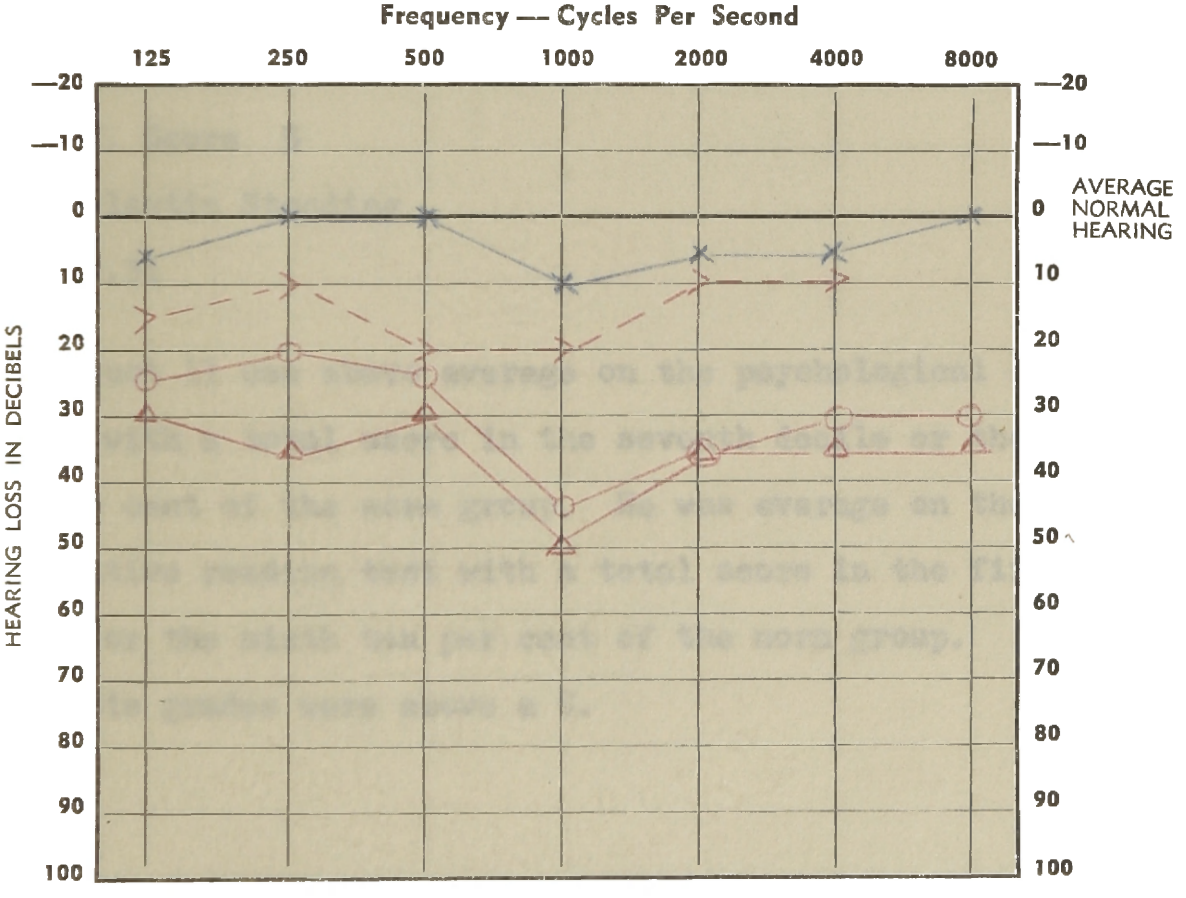
With the exception of the oto-laryngeal diagnosis of chronic suppurative otitis media, the medical findings revealed nothing pertinent to this study.

Audiogram 81

Date 4/2/52 Time 2:00 P.M.

Name Subject 11 Test Clinic

	Inside Room	Outside
Temperature		41° F.
Relative Humidity		68% Raining
Barometric Pressure		28.81
		Wind WSW 18



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Subject 11

2. Test Scores

Psychological Examination

Q. Score 7

L. Score 5

T. Score 7

Cooperative Reading Test

V. Score 5

R. Score 7

C. Score 5

T. Score 5

3. Scholastic Standing

2.31

Subject 11 was above average on the psychological examination with a total score in the seventh decile or the fourth ten per cent of the norm group. He was average on the cooperative reading test with a total score in the fifth decile or the sixth ten per cent of the norm group.

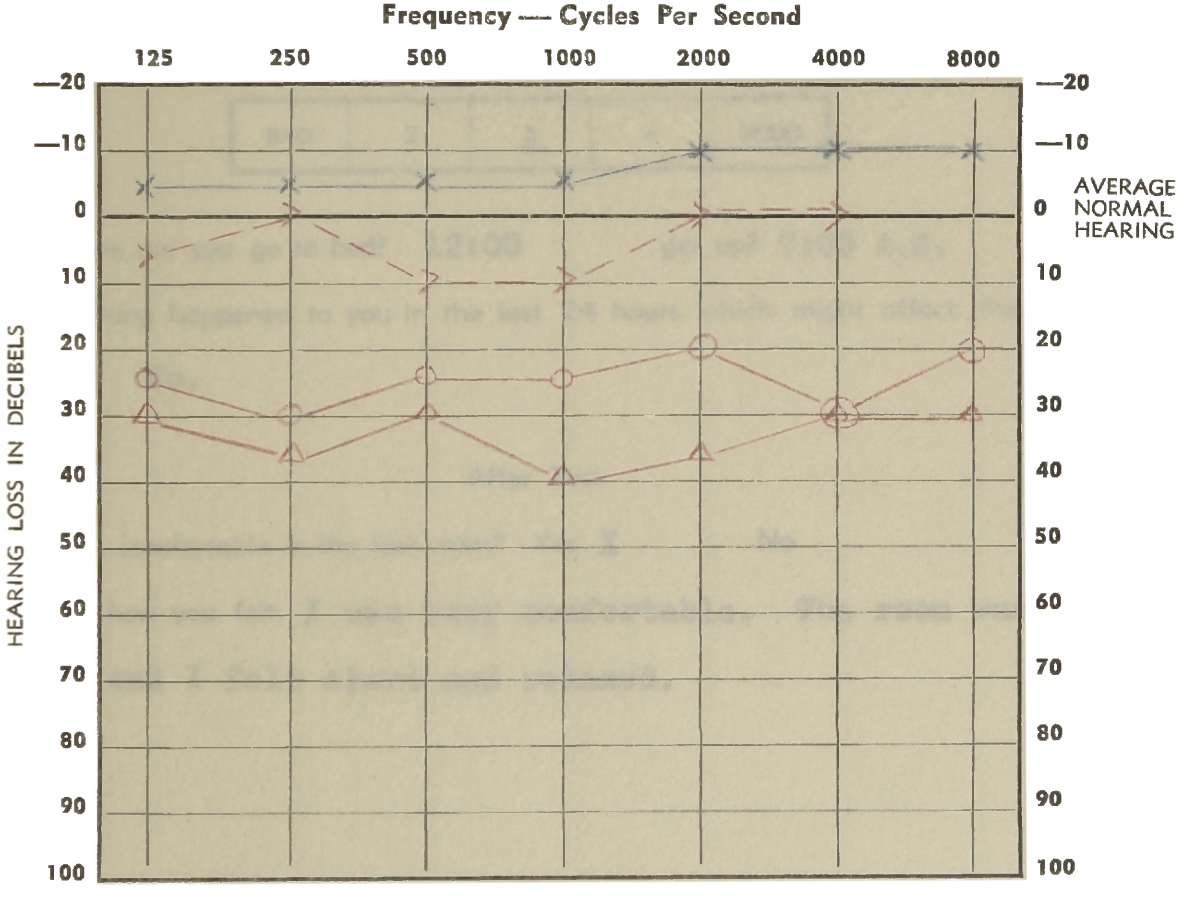
His grades were above a C.

Audiogram 82

Date 4/8/52 Time 2:00 P.M.

Name Subject 11 Test 1

	Inside Room	Outside
Temperature	70° F.	45° F.
Relative Humidity	50%	58%
Barometric Pressure	29.50 Steady	29.33 Steady
		Wind E 8



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	4/8/52	Time	2:00 P.M.
Name	Subject 11	Test	1
	Before Test		After Test
Pulse	84		74
Temperature	97.6°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. Physically good. Psychologically good. Happy because the sun is shining.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		X		

4. What time did you go to bed? 12:00 get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was very comfortable. The room was pleasant and I felt alert and relaxed.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

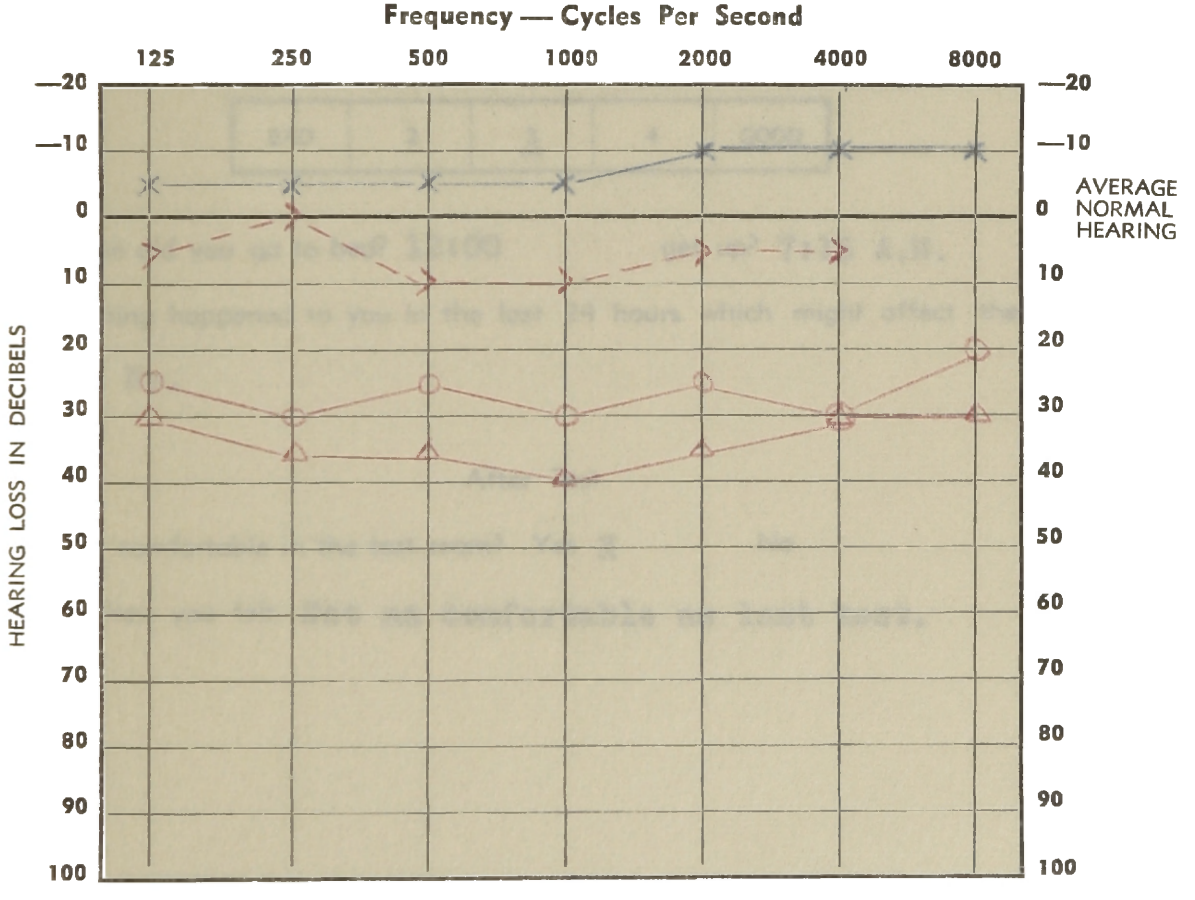
Questionnaire 71

Audiogram 83

Date 4/15/52 Time 1:45 P.M.

Name Subject 11 Test 2

	Inside Room	Outside
Temperature	70° F.	50° F.
Relative Humidity	65%	42%
Barometric Pressure	29.20 Rising	29.12 Rising
Wind		N 30



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	4/15/52	Time	1:45 P.M.
Name	Subject 11	Test	2
	Before Test		After Test
Pulse	84		90
Temperature	98.4°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I was tired all day yesterday. The weather depressed me.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Not as comfortable as last test.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay. NOTE: Weather conditions April 14th: Temperature 35°-37°F. Relative Humidity 98%, raining. Pressure 28.74, falling since April 11th.

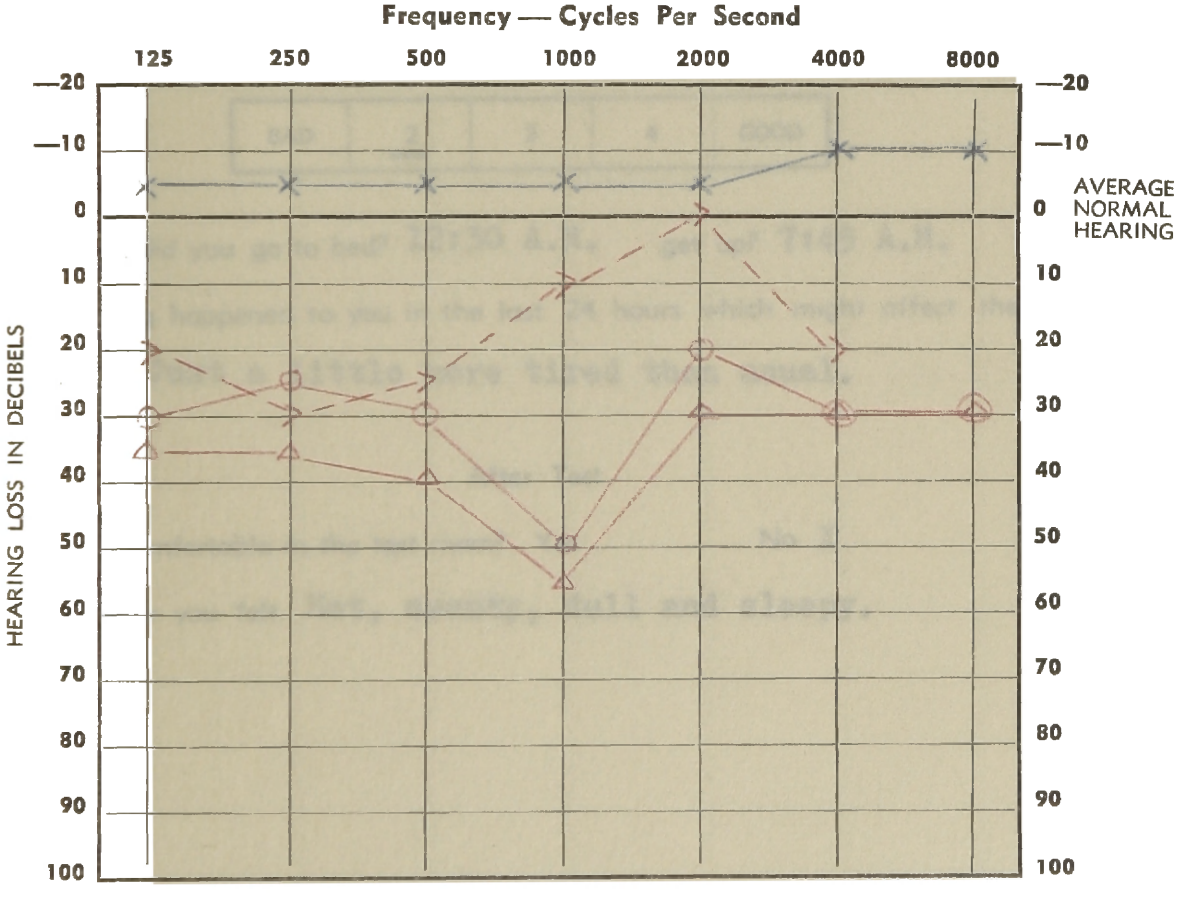
Questionnaire 72

Audiogram 84

Date 4/24/52 Time 2:00 P.M.

Name Subject 11 Test 3

	Inside Room	Outside
Temperature	90° F.	60° F.
Relative Humidity	65%	29%
Barometric Pressure	29.33 Falling	29.20 Falling
Wind		ENE 19



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	4/24/52	Time	2:00 P.M.
Name	Subject 11	Test	3
	Before Test		After Test
Pulse	100		100
Temperature	97.8°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Not enough rest.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Just a little more tired than usual.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Hot, sweaty, dull and sleepy.

8. Comments by operator: Signal lights: 4 to 7 seconds delay. Flickering lights after interrupter had cut out tone. Seemed asleep at one point of test. Profuse sweating. Eyes blood-shot when leaving test room.

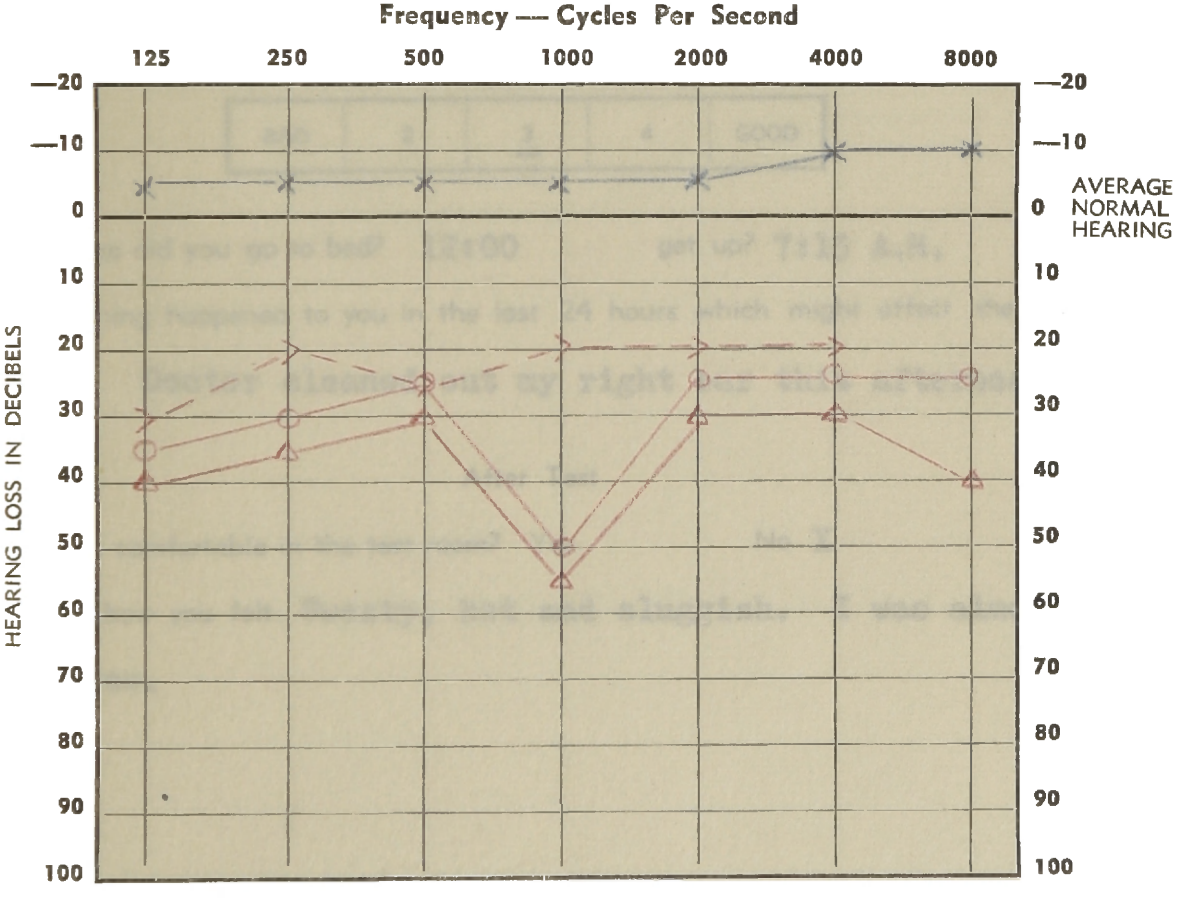
Questionnaire 73

Audiogram 85

Date 4/29/52 Time 2:30 P.M.

Name Subject 11 Test 4

	Inside Room	Outside
Temperature	90° F.	75° F.
Relative Humidity	80%	37%
Barometric Pressure	29.26 Steady	29.08 Steady
Wind		NNE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	4/29/52	Time	2:30 P.M.
Name	Subject 11	Test	4
	Before Test		After Test
Pulse	94		98
Temperature	98°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. Happy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		X		

4. What time did you go to bed? 12:00 get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Doctor cleaned out my right ear this afternoon.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Sweaty, hot and sluggish. I was almost asleep once.

8. Comments by operator: Signal lights: 5 to 8 seconds delay after interrupter cut out tone and 8 to 10 seconds delay in response to tone. Profuse sweating. Seemed asleep at 4000 cycles, right ear, without masking.

Questionnaire 74

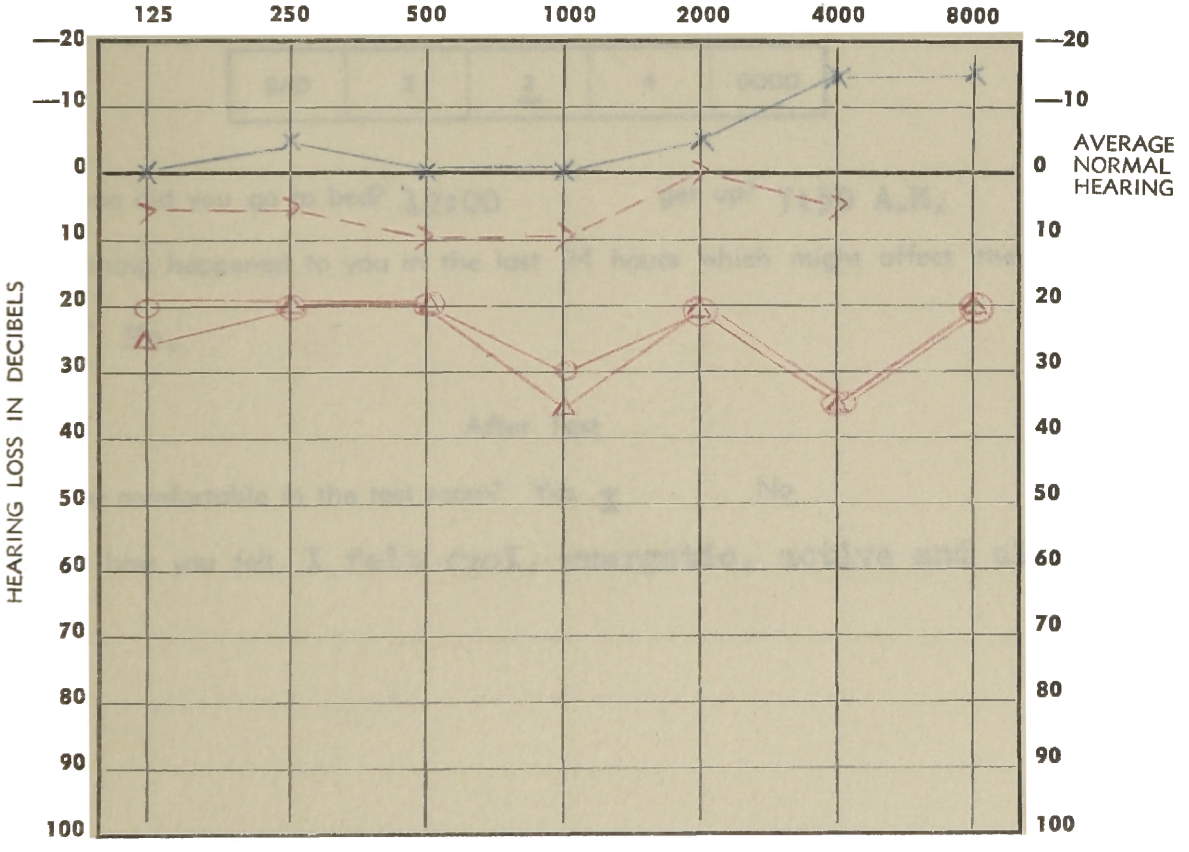
Audiogram 86

Date 5/1/52 Time 3:00 P.M.

Name Subject 11 Test 5

	Inside Room	Outside
Temperature	50° F.	81° F.
Relative Humidity	70%	35%
Barometric Pressure	29.07 Falling	28.96 Falling
Wind		WSW 11

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	5/1/52	Time	3:00 P.M.
Name	Subject 11	Test	5
	Before Test		After Test
Pulse	86		76
Temperature	98.4°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I have been hurrying around all day.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I felt cool, energetic, active and alert.

8. Comments by operator: Consistent threshold at each frequency.

Signal lights: No delay.

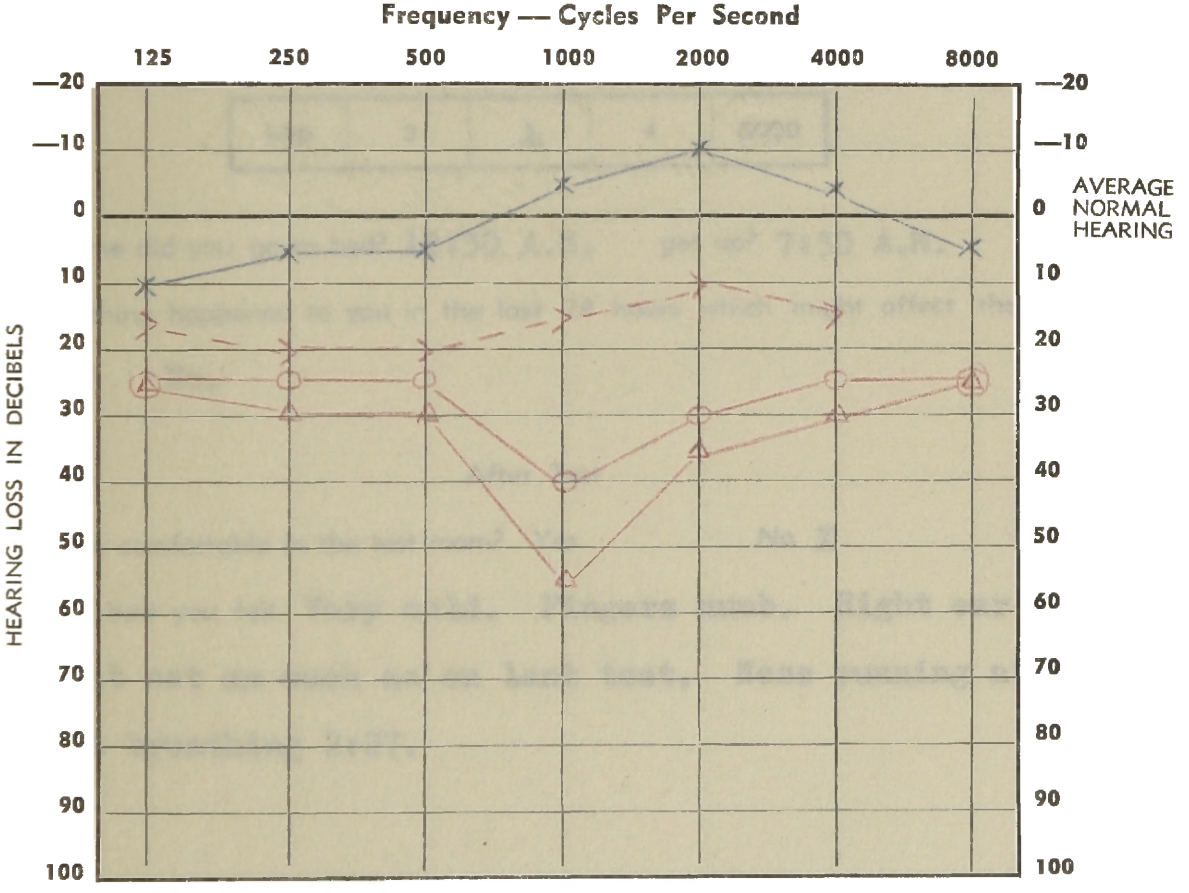
Questionnaire 75

Audiogram 87

Date 5/8/52 Time 2:00 P.M.

Name Subject 11 Test 6

	Inside Room	Outside
Temperature	20° F.	60° F.
Relative Humidity	80%	55%
Barometric Pressure	29.20 Falling	29.04 Falling
Wind		NNE 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	5/8/52	Time	2:00 P.M.
Name	Subject 11	Test	6
	Before Test		After Test
Pulse	96		92
Temperature	97.8°		97.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel average. Not happy, not unhappy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Very cold. Fingers numb. Right ear ached. Alert, but not as much as on last test. Nose running at 2:20. Difficult breathing 2:27.

8. Comments by operator: Signal lights: 6 to 10 seconds delay.

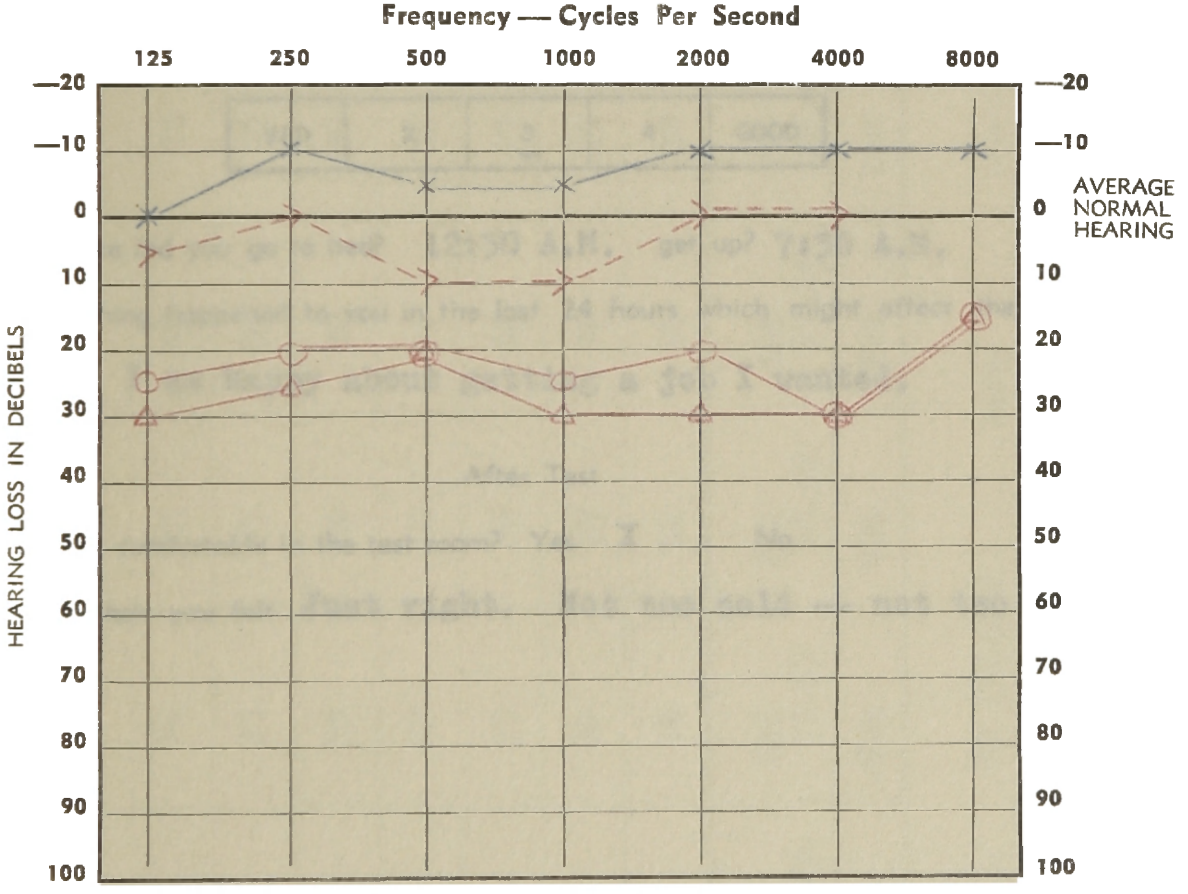
Audiogram 88

Date 5/13/52 Time 2:00 P.M.

Name Subject 11 Test 7

	Inside Room	Outside
Temperature	70° F.	64° F.
Relative Humidity	50%	36%
Barometric Pressure	29.01 Rising	28.92 Rising

Wind



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 2

<| Left Ear with masking at

Date	5/13/52	Time	2:00 P.M.
Name	Subject 11	Test	7
	Before Test		After Test
Pulse	90		80
Temperature	97.8°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very happy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? I am happy about getting a job I wanted.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Just right. Not too cold -- not too warm.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Questionnaire 77

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	30	30	35	40	25	25	30	15
250	35	35	35	35	20	30	25	15
500	30	35	40	30	20	30	20	20
1000	40	40	55	55	35	55	30	25
2000	35	35	30	30	20	35	30	15
4000	30	30	30	30	35	30	30	5
8000	30	30	30	40	20	25	15	25
Loss in db ≤ Loss Ave. Loss	230 32.86	235 33.57	255 36.42	260 37.14	175 25.00	230 32.86	180 25.71	85 12.14
Rank	3rd	5th	6th	7th	1st	3rd	2nd	

Maximum Deviation of 85 (12.14) Decibels Subject 11

Between 50° 70% and 90° 80% Right Ear with Masking

TABLE XXVII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	25	25	30	35	20	25	25	15
250	30	30	25	30	20	25	20	10
500	25	25	30	25	20	25	20	10
1000	25	30	50	50	30	40	25	25
2000	20	25	20	25	20	30	20	10
4000	30	30	30	25	35	25	30	10
8000	20	20	30	25	20	25	15	15
Loss in db ≶ Loss Ave. Loss	175 25.00	185 26.42	215 30.71	215 30.71	165 23.57	195 27.85	155 22.14	60 8.57
Rank	3rd	4th	7th	7th	2nd	5th	1st	

Maximum Deviation of 60 (8.57) Decibels

Between 70° 50%^{2} and $\begin{cases} 90^{\circ} & 80\% \\ 90^{\circ} & 65\% \end{cases}$

Subject 11

Right Ear without Masking

TABLE XXVIII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	5	5	20	30	5	15	5	25
250	0	0	30	20	5	20	0	25
500	10	10	25	25	10	20	10	15
1000	10	10	10	20	10	15	10	10
2000	0	5	0	20	0	10	0	20
4000	0	5	20	20	5	15	0	20
8000								
Loss in db ≤ Loss Ave. Loss	25 4.16	35 5.83	105 17.50	135 22.50	35 5.83	95 15.83	25 4.16	110 18.34
Rank	1st	3rd	6th	7th	3rd	5th	1st	

Maximum Deviation of 110 (18.34) Decibels Subject 11

Between 70° 50% and 90° 80% Right Ear Bone Conduction

TABLE XXIX

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	- 5	- 5	5	5	0	10	0	15
250	- 5	- 5	- 5	- 5	- 5	5	-10	15
500	- 5	- 5	- 5	- 5	0	5	- 5	10
1000	- 5	- 5	- 5	- 5	0	- 5	- 5	5
2000	-10	-10	- 5	- 5	- 5	-10	-10	5
4000	-10	-10	-10	-10	-15	- 5	-10	10
8000	-10	-10	-10	-10	-15	5	-10	20
Loss in db ≤ Loss Ave. Loss	-50 - 7.14	-50 - 7.14	-35 - 5.00	-35 - 5.00	-40 - 5.71	5 .72	-50 - 7.14	55 7.86
Rank	1st	1st	5th	5th	4th	7th	1st	

Maximum Deviation of 55 (7.85) Decibels

Between (70° 50% 1 & 2 (70° 65% and 20° 80%

Subject 11

Left Ear

TABLE XXX

Subject 12

1. Medical Findings

a. Physical Examination

Age: 28

Height: 70"

Weight: 165

General appearance of good health

Heart and lungs: Negative

Chest X-Ray: Negative

Abdomen: Negative

Extremities: Normal

Blood Pressure: 155/85

Nasal septal spur right. Moderate obstruction.

Tonsils present

b. Laboratory Examination

Urinalysis: Negative

Red blood count: 5,310,000

Hemoglobin: 108% 18.0 mgm. per 100 cc.

c. Oto-rhinolaryngeal Examination

History: Suppurative otitis media at three years of age. None since. Frequent rhinitis during cold weather.

Examination:

Mouth: Good occlusion

Throat: Small tonsils

Nasopharynx: Very little adenoid tissue

Nose: Moderate low ridge right

Ears: Right and left tympanum show cloudiness and chronic thickening

Advice: No treatment

Diagnosis: Old obstructive deafness bilateral. Severe left.

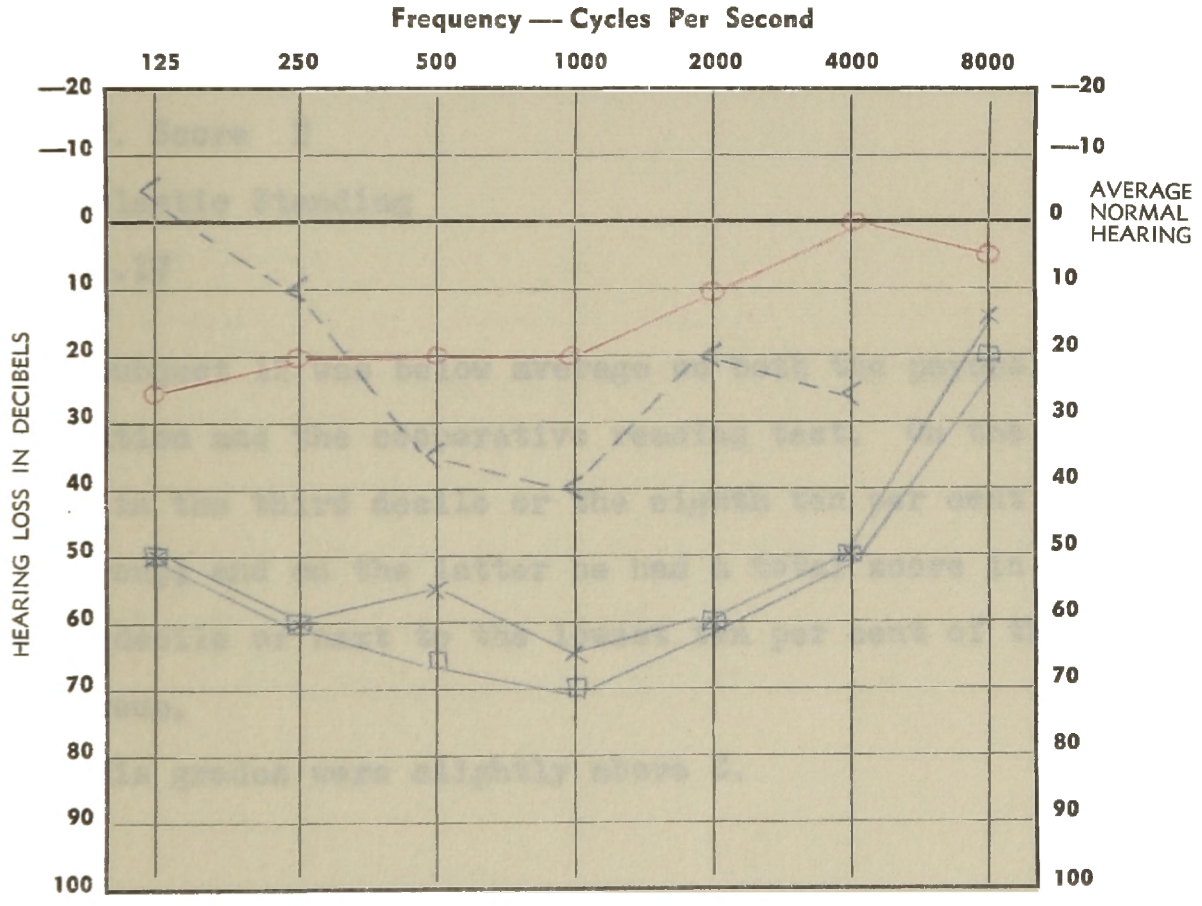
With the exception of the oto-rhinolaryngeal diagnosis of old obstructive deafness bilateral, and the subject's report that he has frequent rhinitis in cold weather, the medical findings revealed nothing pertinent to this study.

Audiogram 89

Date 11/28/51 Time 11:00 A.M.

Name Subject 12 Test Clinic

	Inside Room	Outside
Temperature		35° F.
Relative Humidity		75%
Barometric Pressure		29.06
Wind		S 20



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Subject 12

2. Test Scores

Psychological Examination

Q. Score 2

L. Score 5

T. Score 3

Cooperative Reading Test

V. Score 3

R. Score 2

C. Score 2

T. Score 2

3. Scholastic Standing

2.17

Subject 12 was below average on both the psychological examination and the cooperative reading test. On the former he was in the third decile or the eighth ten per cent of the norm group; and on the latter he had a total score in the second decile or next to the lowest ten per cent of the norm group.

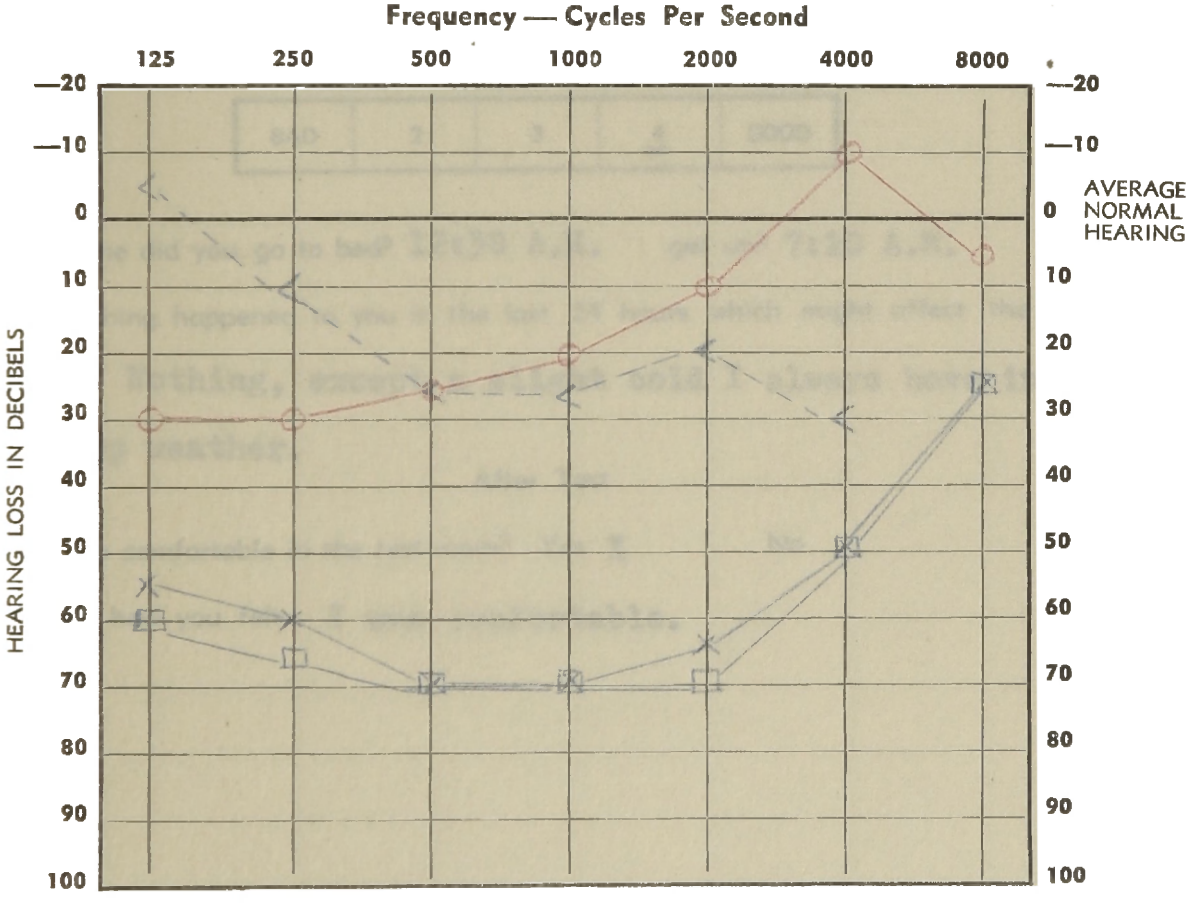
His grades were slightly above C.

Audiogram 90

Date 4/11/52 Time 9:00 A.M.

Name Subject 12 Test 1

	Inside Room	Outside
Temperature	70° F.	28° F.
Relative Humidity	50%	75%
Barometric Pressure	29.67 Falling	29.48 Falling
Wind		NE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	4/11/52	Time	9:00 A.M.
Name	Subject 12	Test	1
	Before Test		After Test
Pulse	80		68
Temperature	97.4°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:20 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing, except a slight cold I always have in cold, damp weather.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was comfortable.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Questionnaire 78

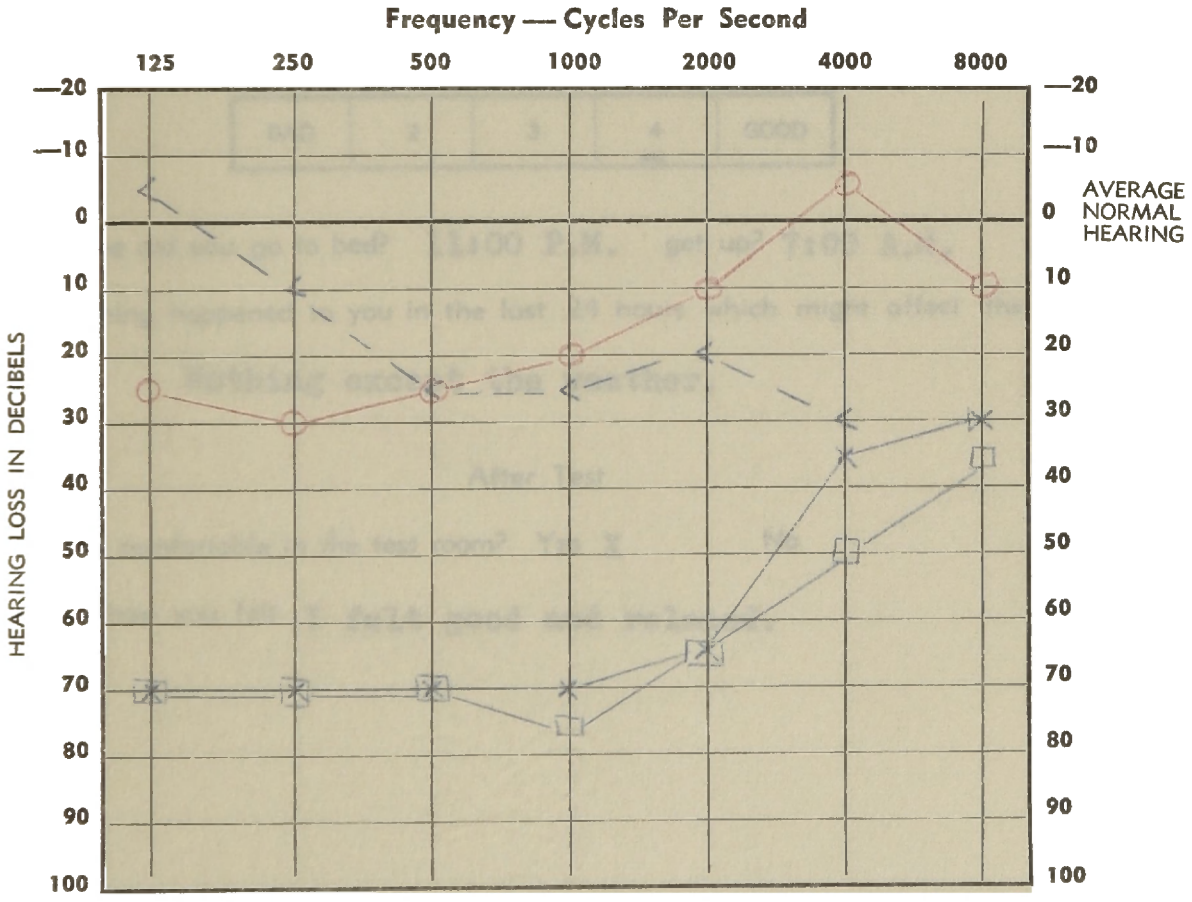
Audiogram 91

Date 4/15/52 Time 11:00 A.M.

Name Subject 12 Test 2

	Inside Room	Outside
Temperature	70° F.	45° F.
Relative Humidity	65%	76%
Barometric Pressure	29.20 Rising	29.03 Rising

Wind N 30



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at

□ Left Ear at _____ 3

Bone Conduction ——————

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	4/15/52	Time	11:00 A.M.
Name	Subject 12	Test	2
	Before Test		After Test
Pulse	80		68
Temperature	97.4°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel good. Just a slight cold. Cold rain such as yesterday's always gives me the "sniffles."

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing except the weather.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I felt good and relaxed.

8. Comments by operator: Consistent threshold at each frequency.

NOTE: April 14th weather: 35°-37°F. Humidity 98%, raining. Pressure: 28.82, falling since April 11th.

Questionnaire 79

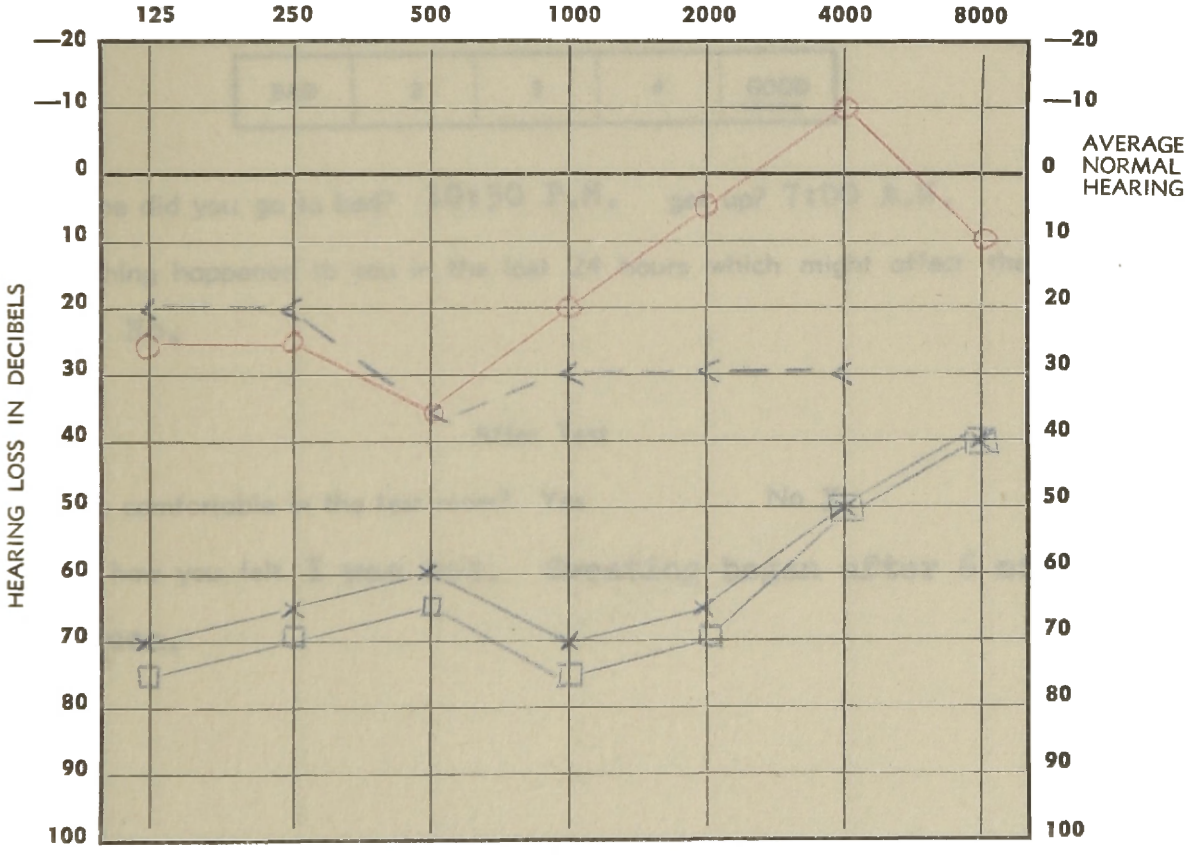
Audiogram 92

Date 4/18/52 Time 10:00 A.M.

Name Subject 12 Test 3

	Inside Room	Outside
Temperature	90° F.	58° F.
Relative Humidity	65%	71%
Barometric Pressure	29.40 Falling	29.19 Falling
Wind		W 15

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	4/18/52	Time	10:00 A.M.
Name	Subject 12	Test	3
	Before Test		After Test
Pulse	68		72
Temperature	98.4°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel good except for a slight head cold.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 7:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was hot. Sweating began after 6 minutes in test room.

8. Comments by operator: Signal lights: 3 to 5 seconds delay.

Questionnaire 80

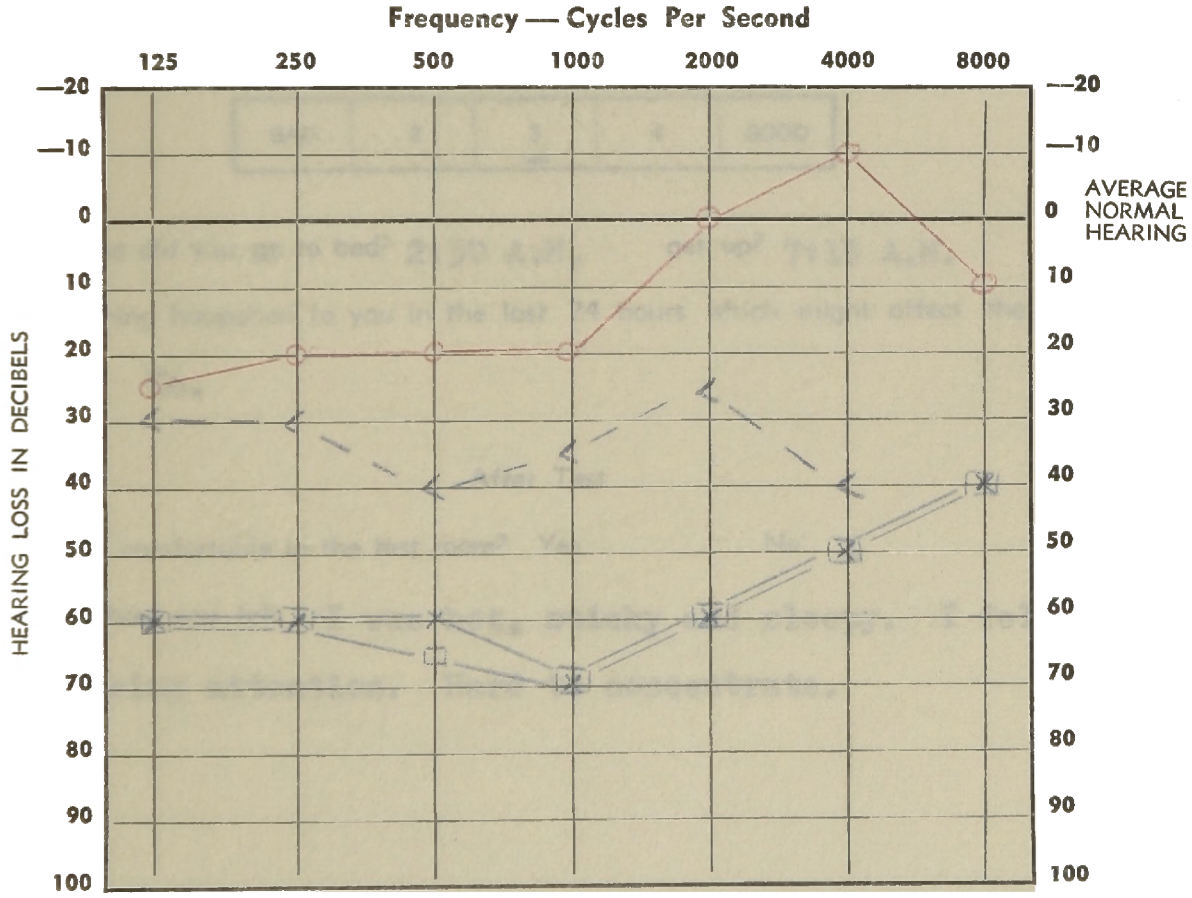
Audiogram 93

Date 4/29/52 Time 8:00 A.M.

Name Subject 12 Test 4

	Inside Room	Outside
Temperature	90° F.	56° F.
Relative Humidity	80%	80%
Barometric Pressure	29.26 Steady	29.08 Steady

Wind NNE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	4/29/52	Time	8:00 A.M.
Name	Subject 12	Test	4
	Before Test		After Test
Pulse	80		72
Temperature	97.8°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. Just a little tired -- and my usual case of sniffles.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		X		

4. What time did you go to bed? 2:30 A.M. get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was hot, sticky and sleepy. I felt myself losing attention. Hard to concentrate.

8. Comments by operator: Signal lights: 5 to 8 seconds delay. Flickering lights after interrupter had cut tone. Subject seemed asleep during latter part of test.

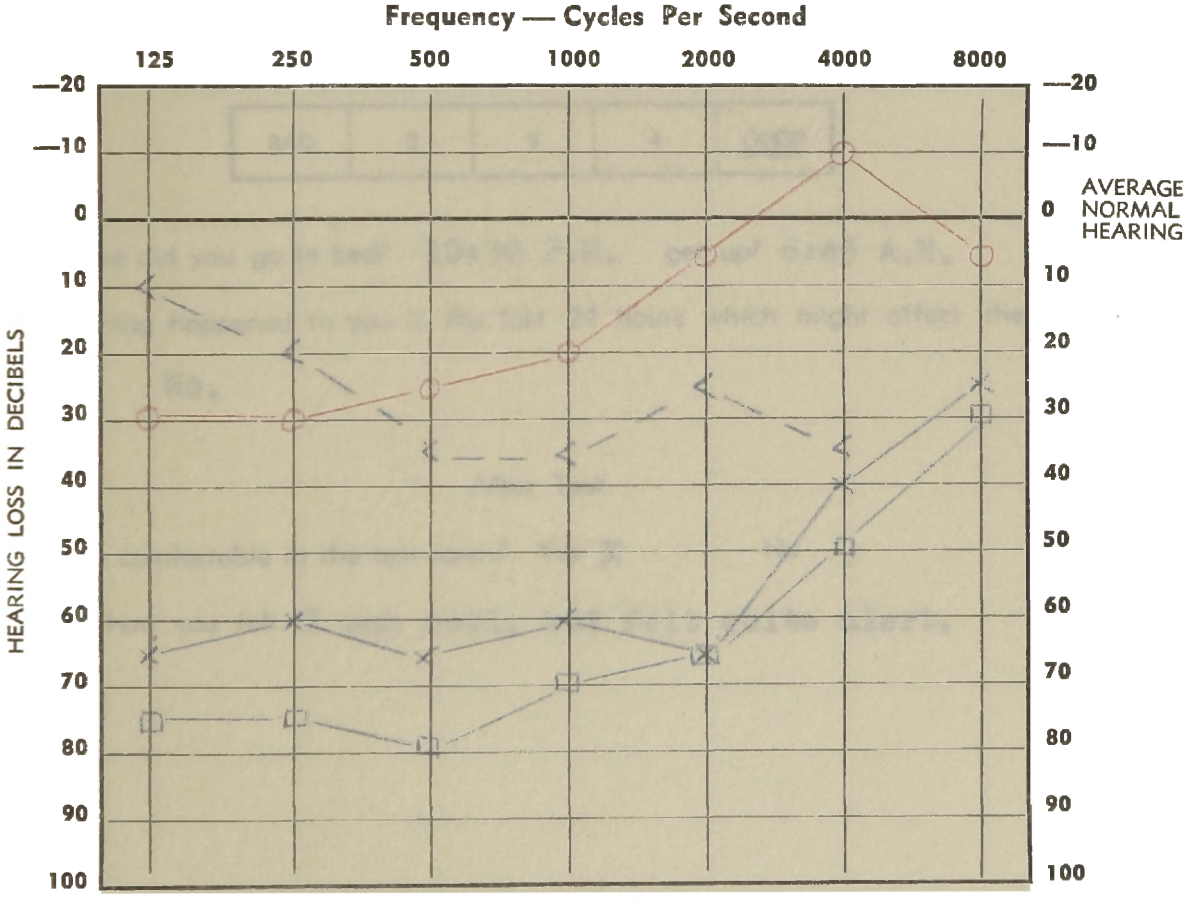
Questionnaire 81

Audiogram 94

Date 5/2/52 Time 8:00 A.M.

Name Subject 12 Test 5

	Inside Room	Outside
Temperature	50° F.	52° F.
Relative Humidity	70%	79%
Barometric Pressure	29.27 Steady	29.06 Steady
Wind		NNE 15



Air Conduction ---

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction ———

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	5/2/52	Time	8:00 A.M.
Name	Subject 12	Test	5
	Before Test		After Test
Pulse	76		60
Temperature	97.4°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Usual head cold.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was cool, but felt quite alert.

8. Comments by operator: Consistent threshold at each frequency except 8000 cycles, left ear with masking.

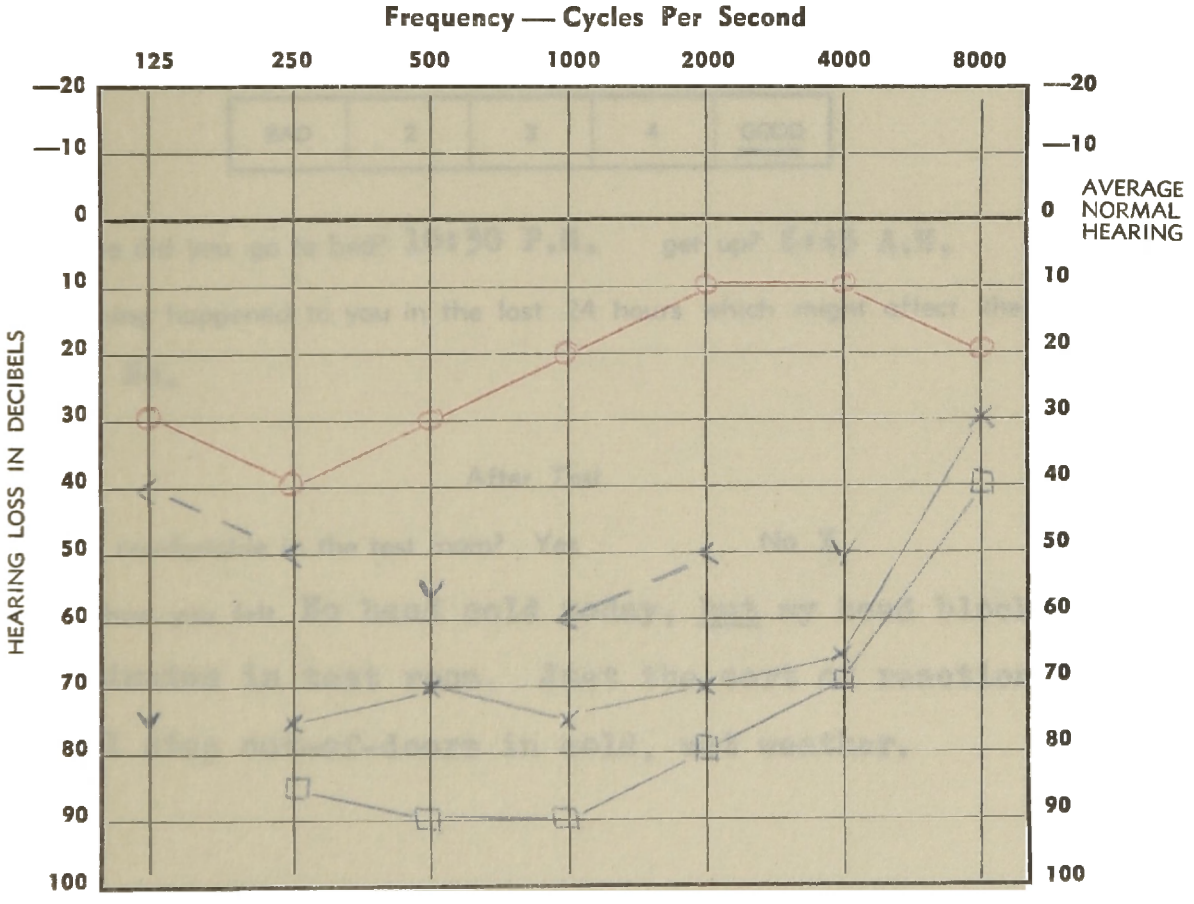
Questionnaire 82

Audiogram 95

Date 5/6/52 Time 8:00 A.M.

Name Subject 12 Test 6

	Inside Room	Outside
Temperature	20° F.	61° F.
Relative Humidity	80%	59%
Barometric Pressure	29.12 Rising	28.92 Rising
Wind		W 17



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	5/6/52	Time	8:00 A.M.
Name	Subject 12	Test	6
	Before Test		After Test
Pulse	72		68
Temperature	97.6°		97.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Just a little concerned about examinations.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. No head cold today, but my head blocked up after 5 minutes in test room. Just the sort of reaction I get when I step out-of-doors in cold, wet weather.

8. Comments by operator: Signal lights: No delay. 125 cycles, left ear: No response. 250, 500 and 4000 cycles, bone conduction: no response. To be retested 5/16/52.

Questionnaire 83

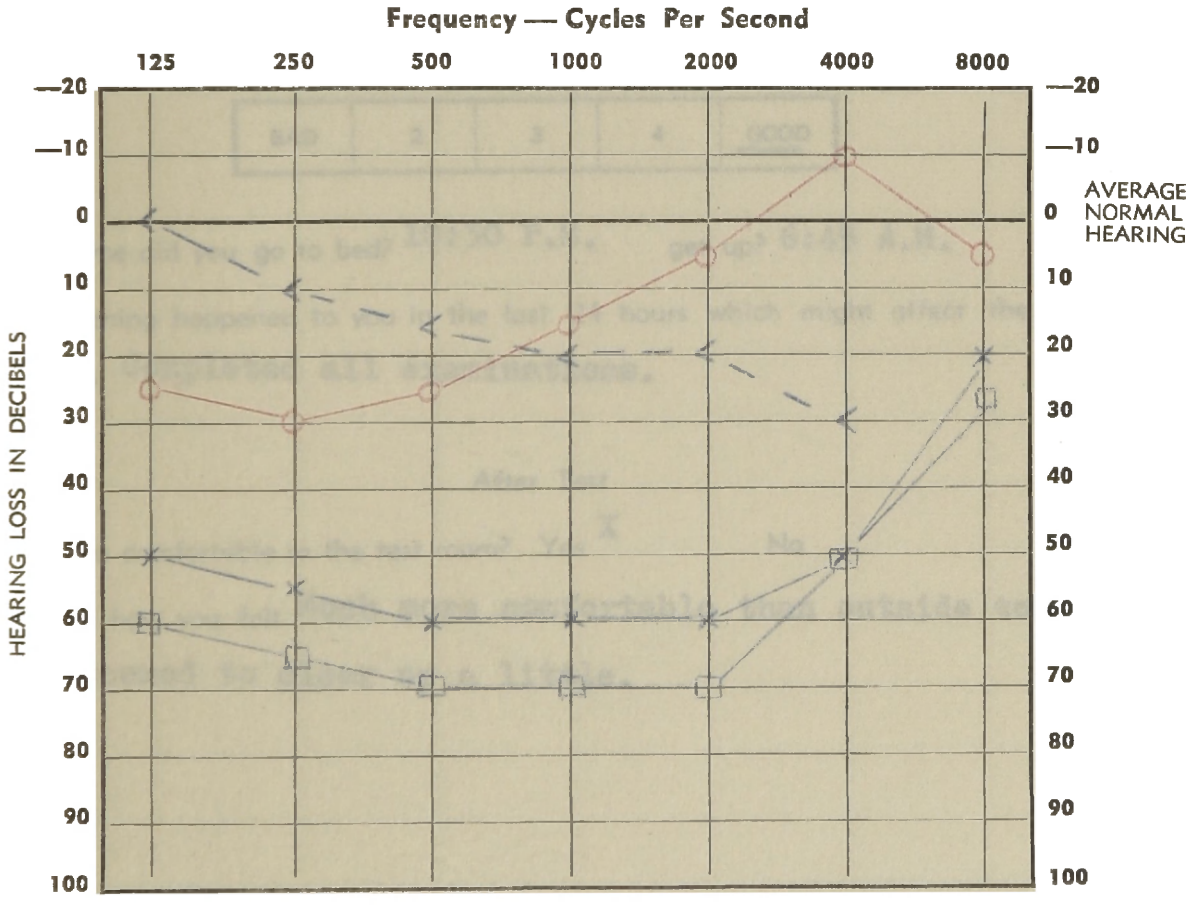
Audiogram 96

Date 5/12/52 Time 10:00 A.M.

Name Subject 12 Test 7

	Inside Room	Outside
Temperature	70° F.	47° F.
Relative Humidity	50%	88% Raining
Barometric Pressure	28.90 Steady	28.70 Steady

Wind W 22



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	5/12/52	Time	10:00 A.M.
Name	Subject 12	Test	7
	Before Test		After Test
Pulse	76		64
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. My usual head cold in wet weather.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:30 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Completed all examinations.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Much more comfortable than outside today. My head seemed to clear up a little.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

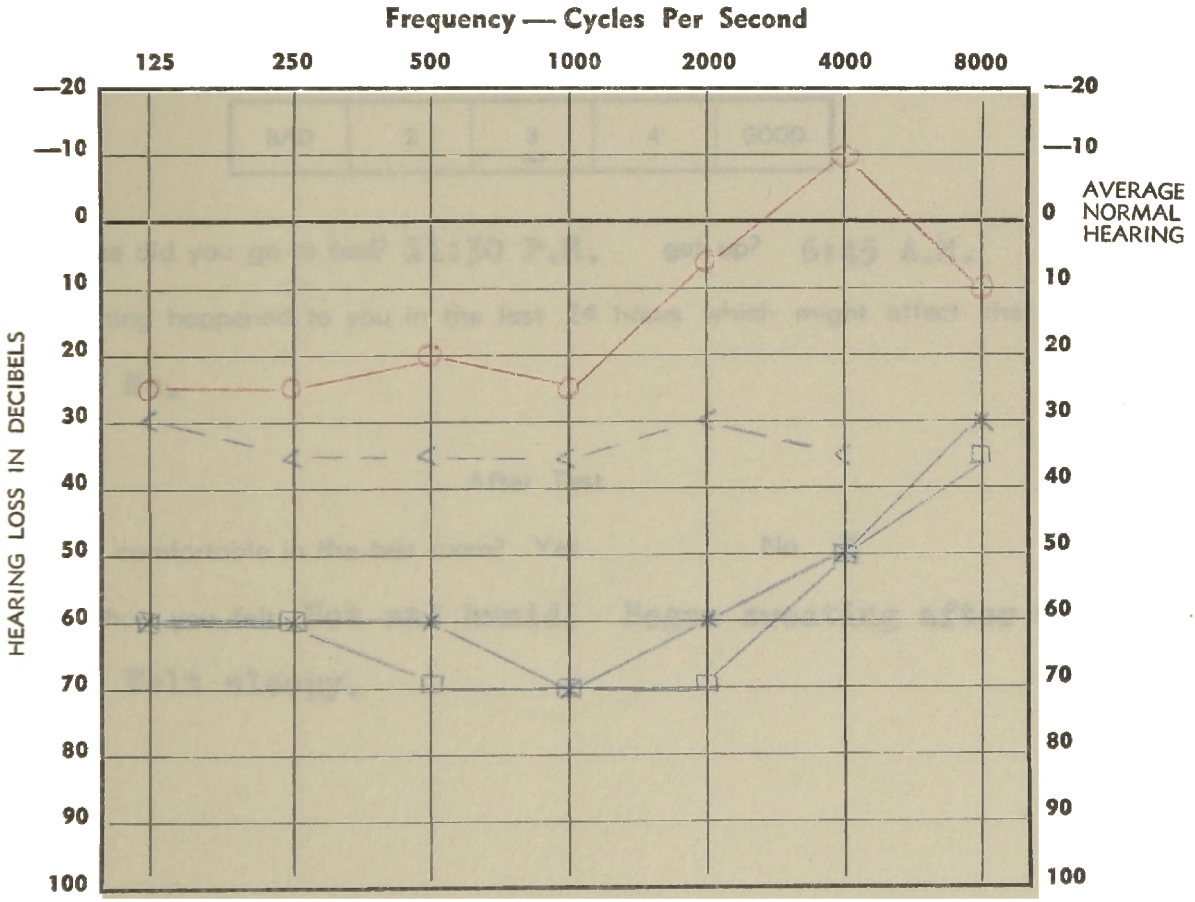
Questionnaire 84

Audiogram 97

Date 4/22/52 Time 9:00 A.M.

Name Subject 12 Test Repeat

	Inside Room	Outside
Temperature	90° F.	63° F.
Relative Humidity	65%	87% Raining
Barometric Pressure	29.43 Falling	29.03 Falling
Wind		SSW 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	4/22/52	Time	9:00 A.M.
Name	Subject 12	Test	Repeat 90°- 65%
	Before Test		After Test
Pulse	64		68
Temperature	97.8°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Good. Head cold has cleared up.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:30 P.M. get up? 6:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Hot and humid. Began sweating after 6 minutes. Felt sleepy.

8. Comments by operator: Signal lights: 3 to 5 seconds delay.

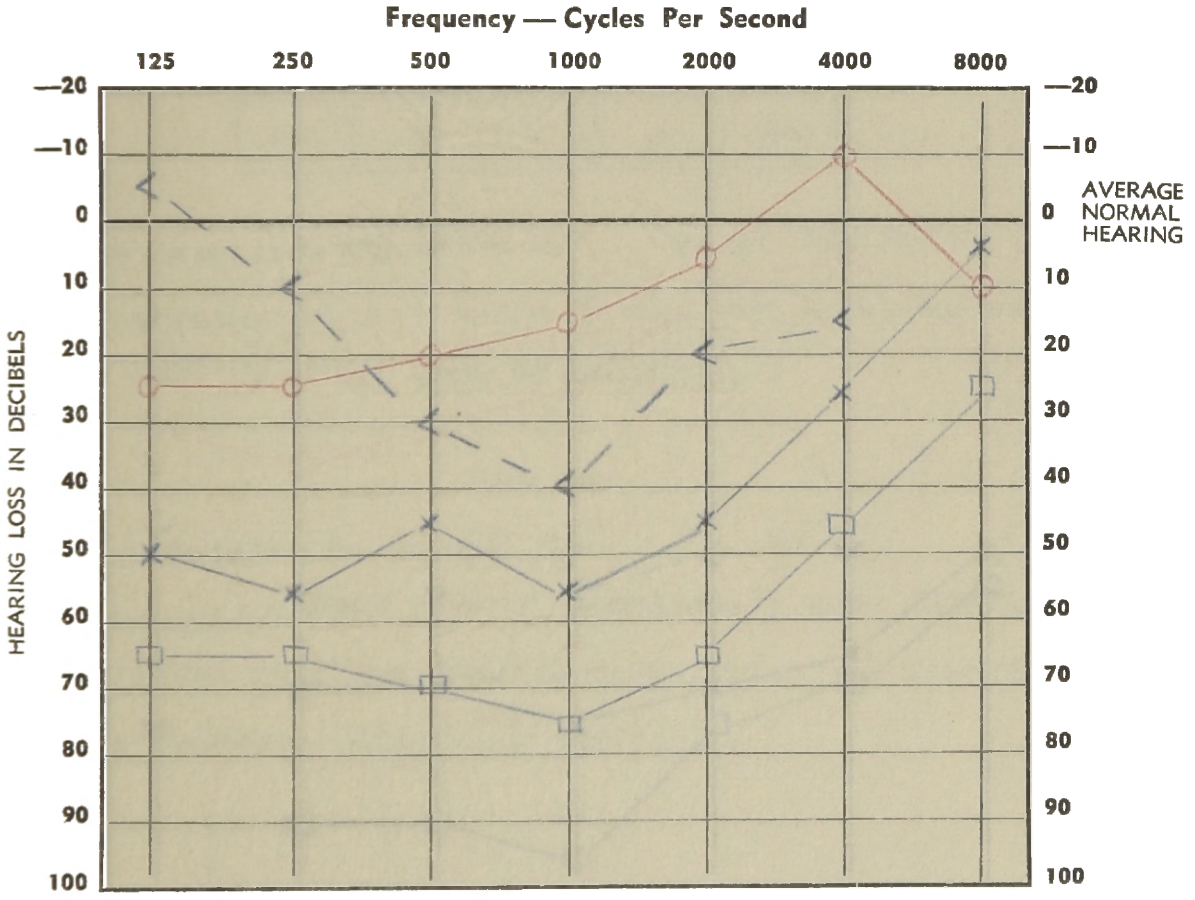
Questionnaire 85

Audiogram 98

Date 5/16/52 Time 8:30 A.M.

Name Subject 12 Test Clinic

	Inside Room	Outside
Temperature		51° F.
Relative Humidity		44%
Barometric Pressure		29.14
Wind		Calm



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 3

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

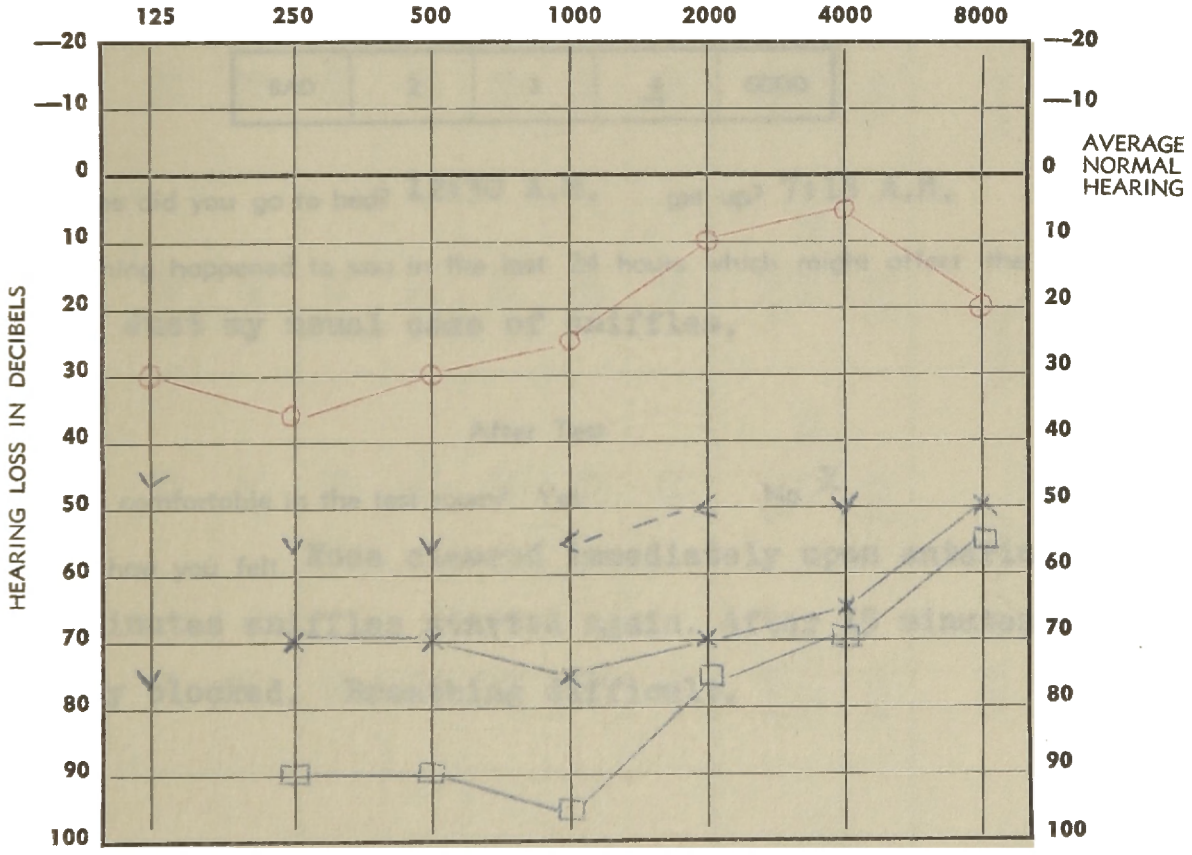
Audiogram 99

Date 5/16/52 Time 9:30 A.M.

Name Subject 12 Test Repeat

	Inside Room	Outside
Temperature	20° F.	51° F.
Relative Humidity	80%	44%
Barometric Pressure	29.32 Steady	29.14 Steady
Wind		Calm

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 3

Date	5/16/52	Time	9:30 A.M.
Name	Subject 12	Test	Repeat 20°-80%
	Before Test		After Test
Pulse	74		64
Temperature	98.2°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I have a slight head cold.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 7:15 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Just my usual case of sniffles.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Nose cleared immediately upon entering room. After 5 minutes sniffles started again. After 15 minutes nose completely blocked. Breathing difficult.

8. Comments by operator: No response at 125 cycles left ear to maximum intensity. No response on bone conduction to any frequency except 1000 and 2000 cycles.

Questionnaire 86

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	60	70	75	60	75	75 NR	60	15
250	65	70	70	60	75	85	65	25
500	70	70	65	65	80	90	70	25
1000	70	75	75	70	70	90	70	20
2000	70	65	70	60	65	80	70	20
4000	50	50	50	50	50	70	50	20
8000	25	35	40	40	30	40	25	15
Loss in db Σ Loss Ave. Loss	410 58.57	435 62.14	445 63.57	405 57.86	445 63.57	530 75.71	410 58.57	125 17.86
Rank	2nd	4th	5th	1st	6th	7th	2nd	

Maximum Deviation of 125 (17.86) Decibels Subject 12

Between 90° 80% and 20° 80% Left Ear with Masking

TABLE XXXI

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	55	70	70	60	65	75 NR	50	25
250	60	70	65	60	60	75	55	15
500	70	70	60	60	65	70	60	10
1000	70	70	70	70	60	75	60	15
2000	65	65	65	60	65	70	60	10
4000	50	35	50	50	40	65	50	30
8000	20	30	40	40	25	30	20	20
Loss in db Σ Loss Ave. Loss	390 55.71	410 58.57	420 60.00	400 57.14	380 54.28	460 65.71	355 50.71	105 15.00
Rank	3rd	5th	6th	4th	2nd	7th	1st	

Maximum Deviation of 105 (15.00) Decibels Subject 12

Between 70^{0} 50% and 20^{0} 80% Left Ear without Masking

TABLE XXXII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	- 5	- 5	20	30	10	40	0	45
250	5	10	20	30	20	50 NR	10	45
500	15	25	35	40	35	55 NR	15	40
1000	15	25	30	35	35	60	20	45
2000	20	20	30	25	25	50	20	30
4000	25	30	30	40	35	50 NR	30	25
8000								
Loss in db Σ Loss Ave. Loss	75 12.50	105 17.50	165 27.50	200 33.33	160 26.66	305 50.83	95 15.83	230 38.33
Rank	1st	3rd	5th	6th	4th	7th	2nd	

Maximum Deviation of 230 (38.33) Decibels Subject 12

Between 70° 50%[1] and 20° 80% Left Ear Bone Conduction

TABLE XXXIII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	30	25	25	25	30	30	25	5
250	30	30	25	20	30	40	30	20
500	25	25	35	20	25	30	25	15
1000	20	20	20	20	20	20	15	5
2000	10	10	5	0	5	10	5	10
4000	-10	- 5	-10	-10	-10	10	-10	20
8000	5	5	10	10	5	20	5	15
Loss in db $\leq$ Loss Ave. Loss	110 15.71	110 15.71	110 15.71	85 12.14	105 15.00	160 22.86	95 13.57	75 10.71
Rank	4th	4th	4th	1st	3rd	7th	2nd	

Maximum Deviation of 75 (10.71) Decibels Subject 12

Between 90° 80% and 20° 80% Right Ear

TABLE XXXIV

Subject 13

1. Medical Findings

a. Physical Examination

Age: 19

Height: 74"

Weight: 174

Examination entirely negative throughout

Tonsils present

Blood pressure: 115/75

Chest X-Ray: Negative

b. Laboratory Examination

Urinalysis: Normal

Red blood count: 4,870,000

Hemoglobin: 93% 15.5 mgm. per 100 cc.

c. Oto-rhinolaryngeal Examination

History: Intermittent otitis media suppurative left since early childhood with deafness. Right ear frequently full and deaf. Frequent headaches and acute rhinitis during cold weather.

Examination:

Throat: Small spetic tonsils with very little adenoid tissue

Nose: Acute rhinitis

Ears: Left tympanum scarred with old perforation. Right tympanum scarred.

Advice: Tonsils and adenoids

Diagnosis: Intermittent otitis media suppurative left.
Chronic catarrhal otitis media right.
Septic tonsils and adenoids.
Obstructive deafness bilateral moderate.

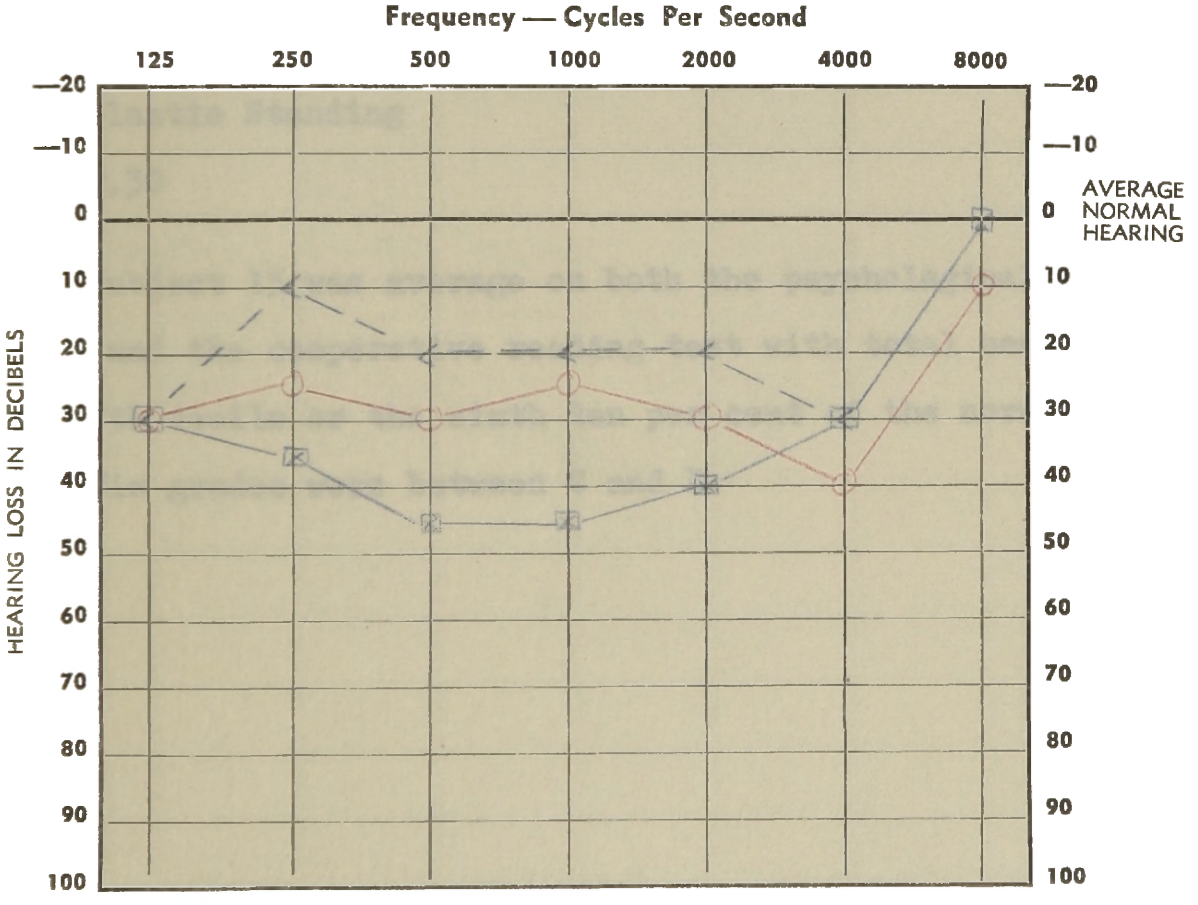
With the exception of the oto-rhinolaryngeal diagnosis of intermittent otitis media suppurative left and chronic catarrhal otitis media right with obstructive deafness bilateral, the physical examination was negative throughout and revealed nothing pertinent to this study.

Audiogram 100

Date 11/11/51 Time 2:00 P.M.

Name Subject 13 Test Clinic

	Inside Room	Outside
Temperature		42° F.
Relative Humidity		72%
Barometric Pressure		29.32
Wind		ESE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

2

2. Test Scores

Psychological Examination

Q. Score 4

L. Score 6

T. Score 5

Cooperative Reading Test

V. Score 4

R. Score 6

C. Score 6

T. Score 5

3. Scholastic Standing

2.30

Subject 13 was average on both the psychological examination and the cooperative reading test with total scores in the fifth decile or the sixth ten per cent of the norm group.

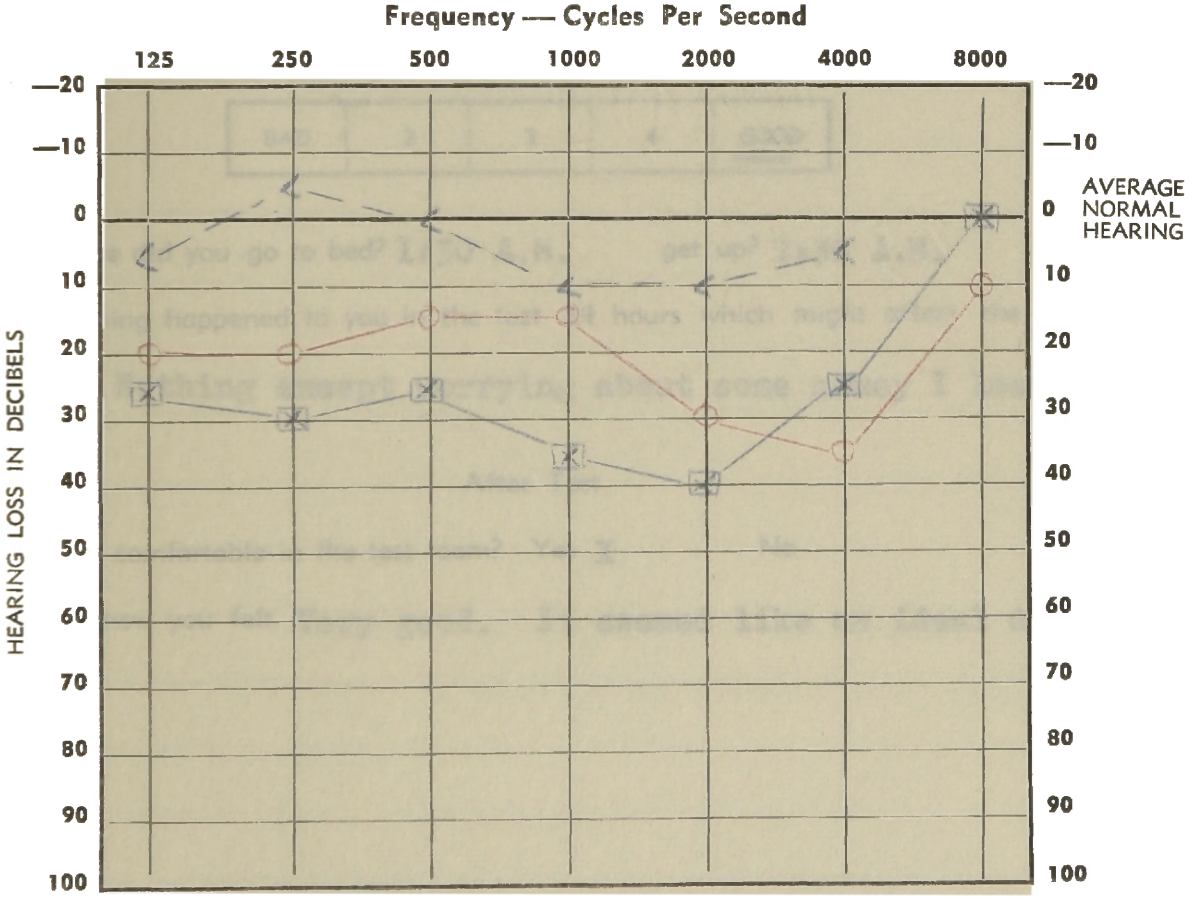
His grades were between C and B.

Audiogram 101

Date 4/8/52 Time 3:00 P.M.

Name Subject 13 Test 1

	Inside Room	Outside
Temperature	70° F.	47° F.
Relative Humidity	50%	58%
Barometric Pressure	29.50 Steady	29.33 Steady
Wind		E 8



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	4/8/52	Time	3:00 P.M.
Name	Subject 13	Test	1
	Before Test		After Test
Pulse	84		72
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. I have a slight head cold.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
				X

4. What time did you go to bed? 1:30 A.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing except worrying about some money I lost.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. Very good. It seemed like an ideal day in spring.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

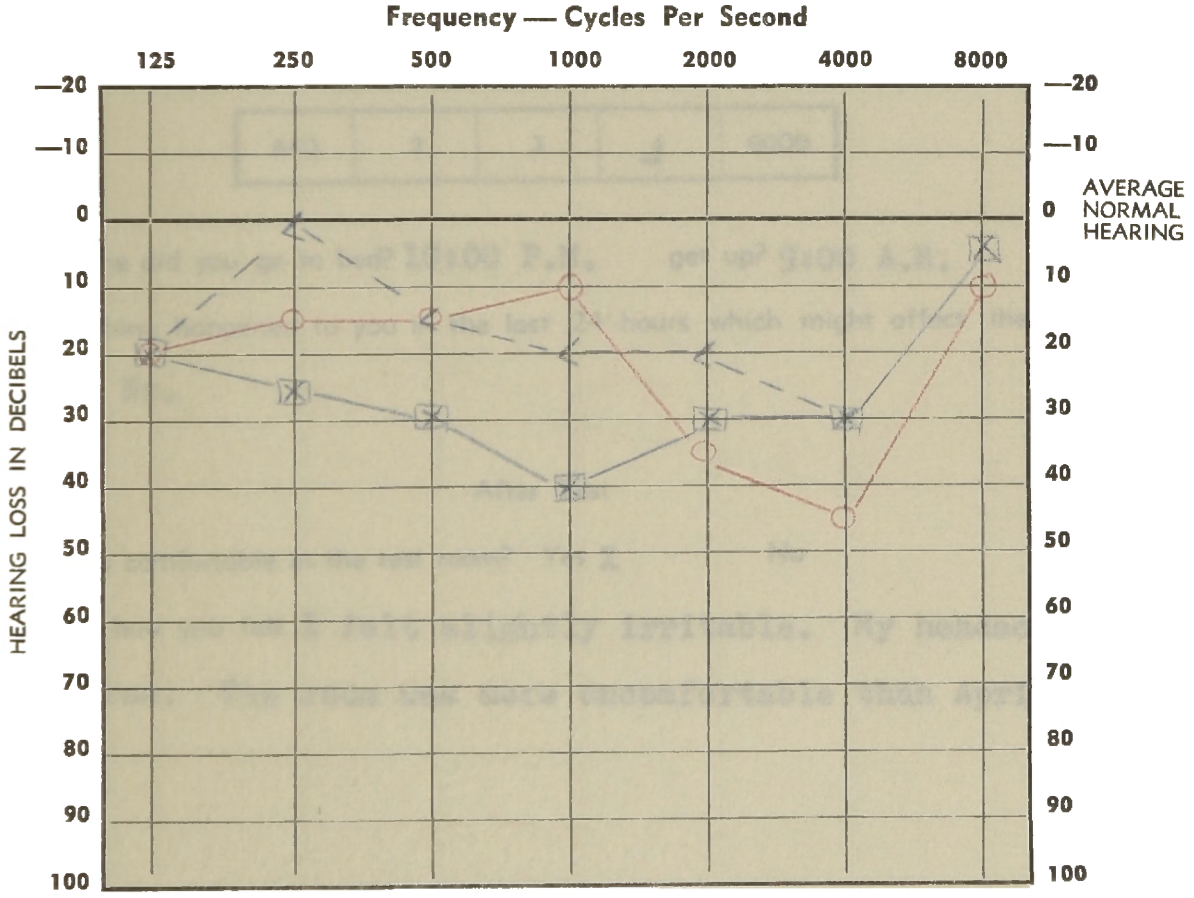
Audiogram 102

Date 4/15/52 Time 2:30 P.M.

Name Subject 13 Test 2

	Inside Room	Outside
Temperature	70° F.	50° F.
Relative Humidity	65%	42%
Barometric Pressure	29.35 Rising	29.12 Steady

Wind N 30



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	4/15/52	Time	2:30 P.M.
Name	Subject 13	Test	2
	Before Test		After Test
Pulse	84		88
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. A slight headache.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 10:00 P.M. get up? 9:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I felt slightly irritable. My headache seemed worse. The room was more uncomfortable than April 8th test.

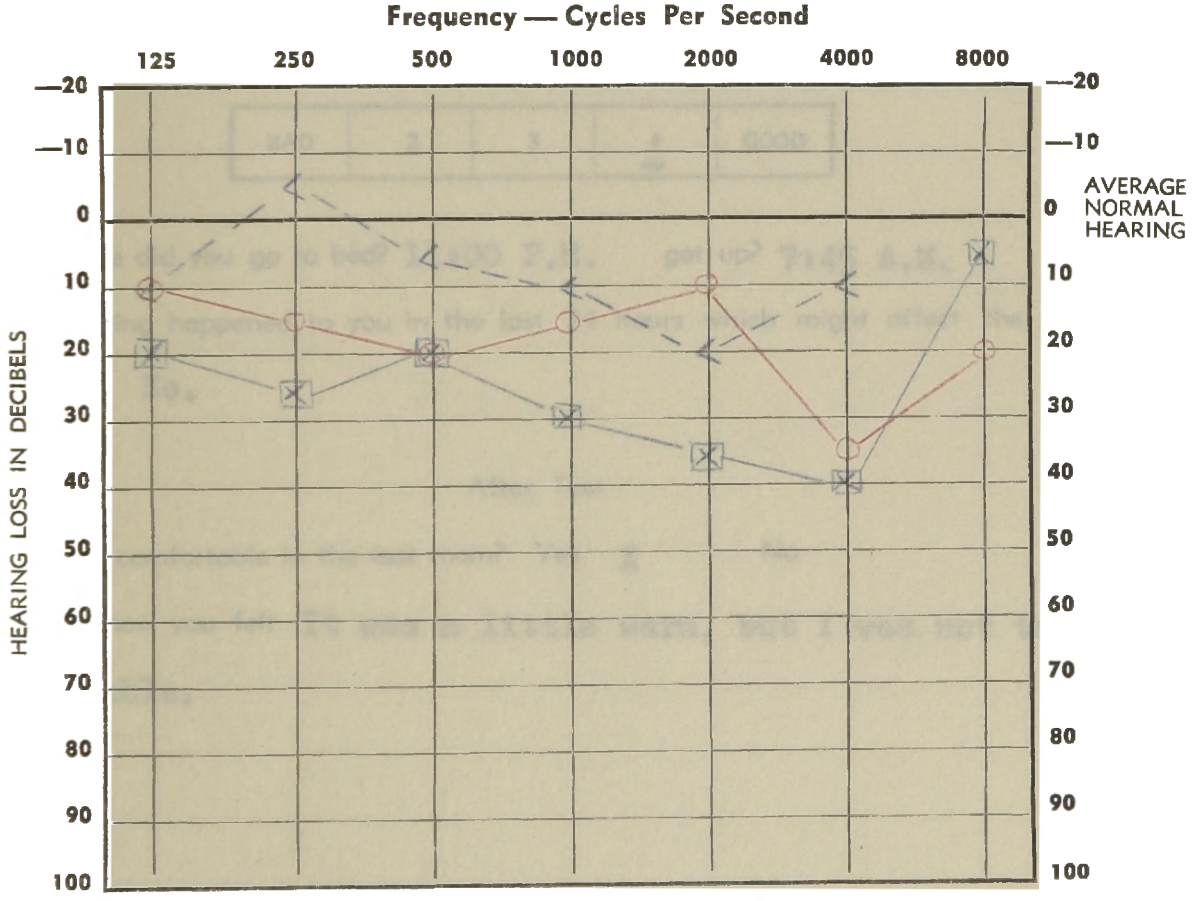
8. Comments by operator: Consistent threshold at each frequency except bone conduction. Signal lights: No delay.

Audiogram 103

Date 4/22/52 Time 2:00 P.M.

Name Subject 13 Test 3

	Inside Room	Outside
Temperature	90° F.	65° F.
Relative Humidity	65%	79% Raining
Barometric Pressure	29.21 Steady	29.00 Steady
Wind		SSW 15



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

2

Date	4/22/52	Time	2:00 P.M.
Name	Subject 13	Test	3
	Before Test		After Test
Pulse	88		74
Temperature	98.2°		99°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
		_		

2. Describe how you feel. Good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
			_	

4. What time did you go to bed? 11:00 P.M. get up? 7:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. It was a little warm, but I was not too uncomfortable.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Questionnaire 89

Audiogram 104

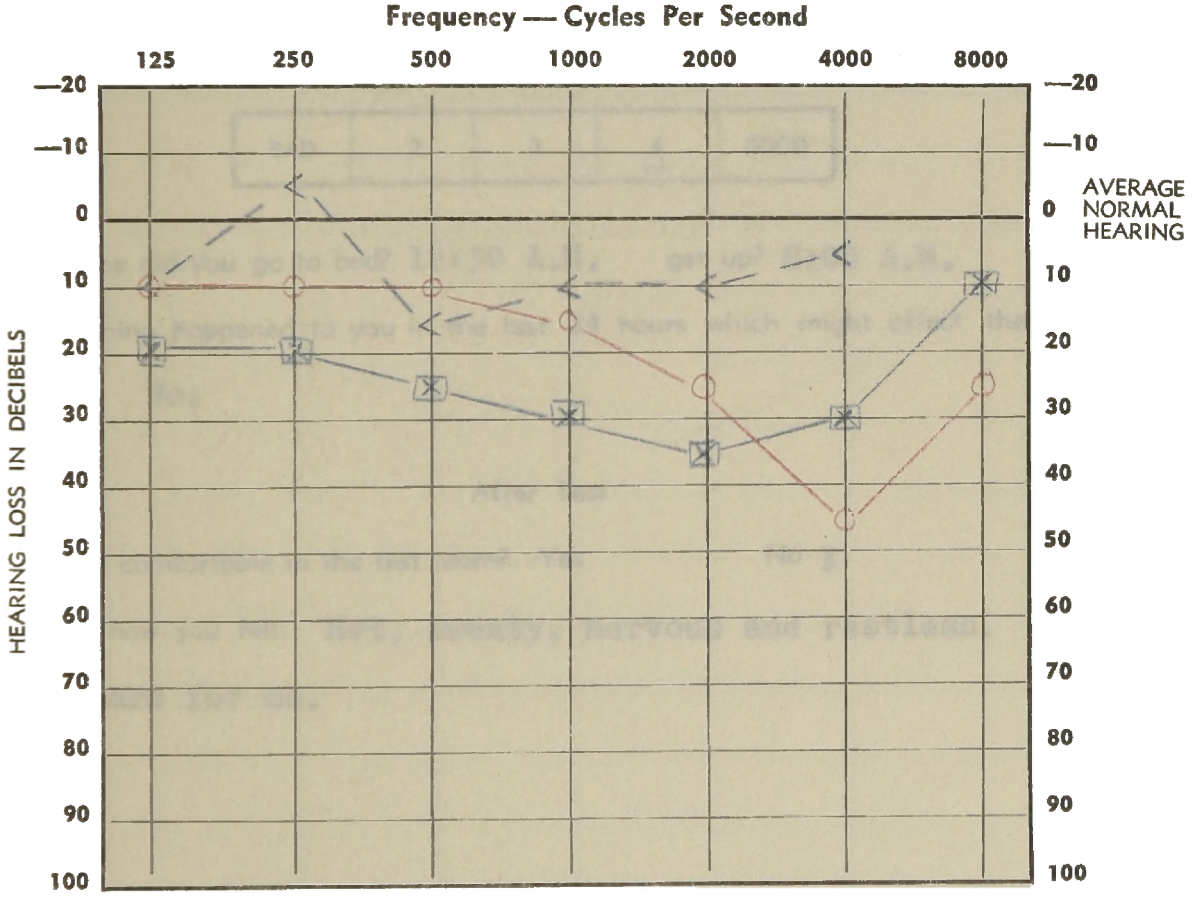
Date 4/29/52

Time 3:15 P.M.

Name Subject 13

Test 4

	Inside Room	Outside
Temperature	90° F.	75° F.
Relative Humidity	80%	37%
Barometric Pressure	29.26 Steady	29.08 Steady
Wind		NNE 10



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 2

□ Left Ear at

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	4/29/52	Time	3:15 P.M.
Name	Subject 13	Test	4
	Before Test		After Test
Pulse	86		88
Temperature	98.6°		99°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Have just finished playing softball and am a little tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:30 A.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Hot, sweaty, nervous and restless. This was too warm for me.

8. Comments by operator: Signal lights: 5 to 8 seconds delay.

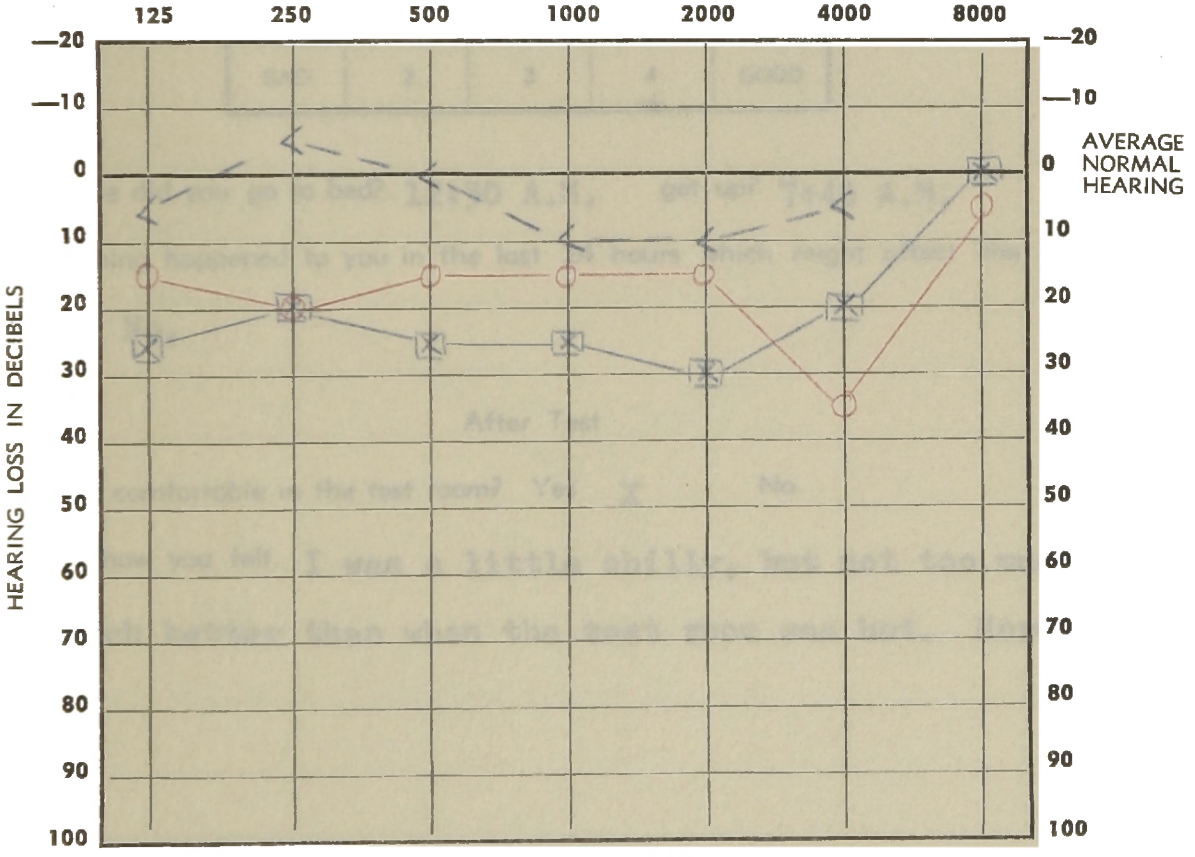
Audiogram 105

Date 5/2/52 Time 10:00 A.M.

Name Subject 13 Test 5

	Inside Room	Outside
Temperature	50° F.	69° F.
Relative Humidity	70%	79%
Barometric Pressure	29.27 Steady	29.06 Steady
		Wind NNE 15

Frequency — Cycles Per Second



Air Conduction

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at

□ Left Ear at _____ 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear _____ with masking at 2

Date	5/2/52	Time	10:00 A.M.
Name	Subject 13	Test	5
	Before Test		After Test
Pulse	64		70
Temperature	98.2°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
	—			

2. Describe how you feel. I have a slight cold and a headache.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
			—	

4. What time did you go to bed? 12:30 A.M. get up? 7:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was a little chilly, but not too much. I felt much better than when the test room was hot. More alert.

8. Comments by operator: Consistent threshold except at 1000 cycles, both ears. Signal lights: No delay.

Questionnaire 91

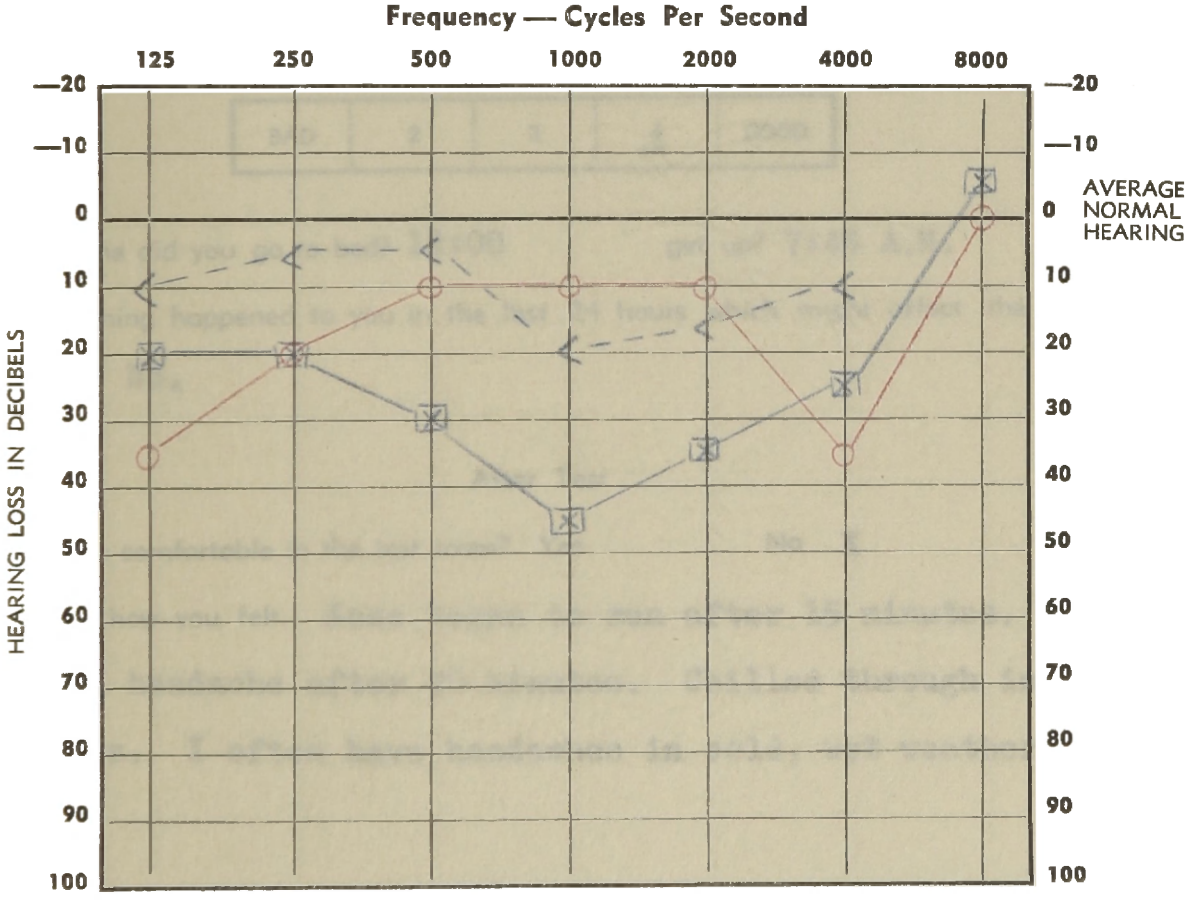
Audiogram 106

Date 5/6/52 Time 2:00 P.M.

Name Subject 13 Test 6

	Inside Room	Outside
Temperature	20° F.	64° F.
Relative Humidity	80%	43%
Barometric Pressure	29.24 Rising	28.99 Rising

Wind W 30



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at 2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at 2

Date	5/6/52	Time	2:00 P.M.
Name	Subject 13	Test	6
	Before Test		After Test
Pulse	96		68
Temperature	98.6°		97.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
		X		

2. Describe how you feel. Feel fine.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
			X	

4. What time did you go to bed? 12:00 get up? 7:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Nose began to run after 15 minutes. Developed headache after 20 minutes. Chilled through in 30 minutes. I often have headaches in cold, wet weather.

8. Comments by operator: Signal lights: 6 to 8 seconds delay. Lights flickering after interrupter had cut out tone.

Questionnaire 92

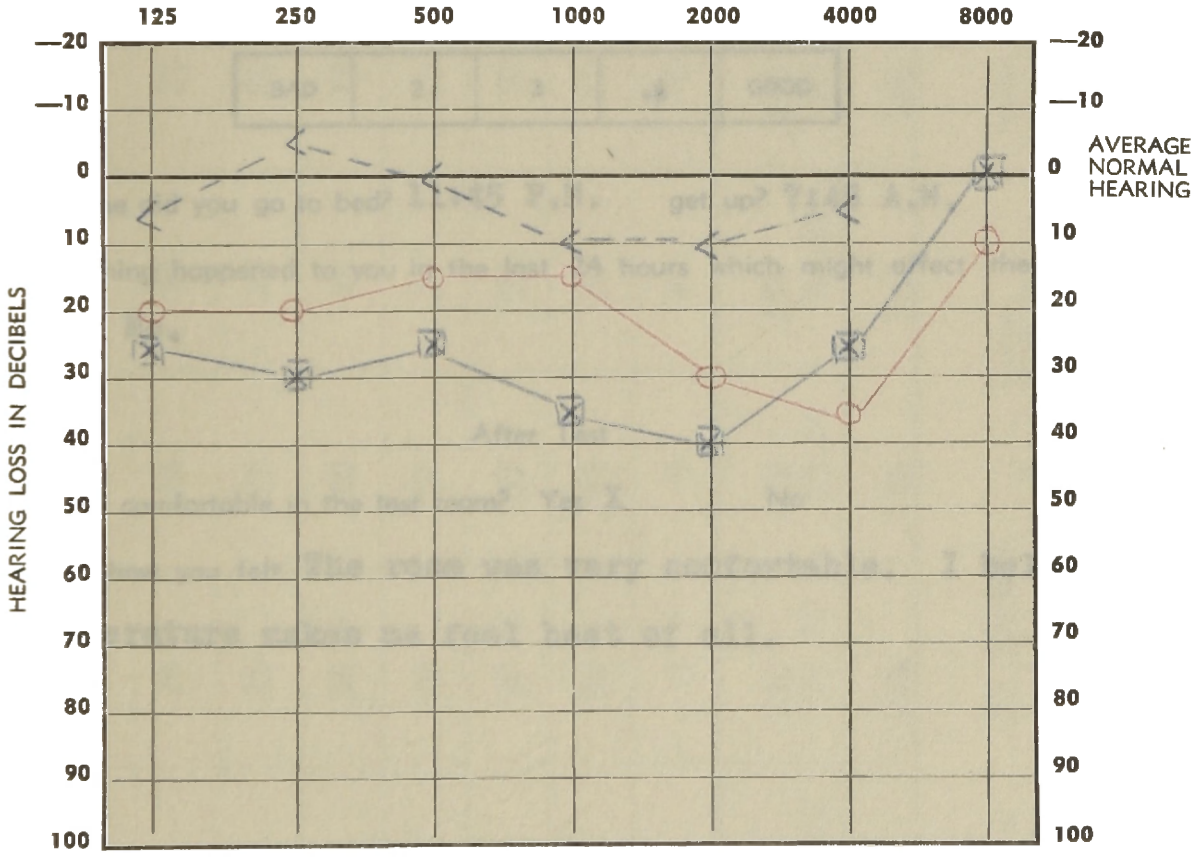
Audiogram 107

Date 5/12/52 Time 10:45 A.M.

Name Subject 13 Test 7

	Inside Room	Outside
Temperature	70° F.	47° F.
Relative Humidity	50%	88% Raining
Barometric Pressure	28.90 Steady	28.70 Steady
		Wind WSW 13

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at

□ Left Ear at

2

Bone Conduction

|> Right Ear with masking at

<| Left Ear with masking at

2

Date	5/12/52	Time	10:45 A.M.
Name	Subject 13	Test	7
	Before Test		After Test
Pulse	74		74
Temperature	98.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. Very good.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:45 P.M. get up? 7:45 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. The room was very comfortable. I believe this temperature makes me feel best of all.

8. Comments by operator: Consistent threshold at each frequency. Subject seemed alert. Signal lights: No delay.

Questionnaire 93

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	25	20	20	20	25	20	25	5
250	30	25	25	20	20	20	30	10
500	25	30	20	25	25	30	25	10
1000	35	40	30	30	25	45	35	20
2000	40	30	35	35	30	35	40	10
4000	25	30	40	30	20	25	25	20
8000	0	5	5	10	0	- 5	0	15
Loss in db ≤ Loss Ave. Loss	180 25.71	180 25.71	175 25.00	170 24.28	145 20.71	170 24.28	180 25.71	35 5.00
Rank	7th	7th	4th	2nd	1st	2nd	7th	

Maximum Deviation of 35 (5.00) Decibels

Between 50° 70% and (70° 50% / 70° 65%) 1 & 2

Subject 13

Left Ear with Masking

TABLE XXXV

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	25	20	20	20	25	20	25	5
250	30	25	25	20	20	20	30	10
500	25	30	20	25	25	30	25	10
1000	35	40	30	30	25	45	35	15
2000	40	30	35	35	30	35	40	10
4000	25	30	40	30	20	25	25	20
8000	0	5	5	10	0	- 5	0	15
Loss in db ≤ Loss Ave. Loss	180 25.71	180 25.71	175 25.00	170 24.28	145 20.71	170 24.28	180 25.71	35 5.00
Rank	7th	7th	4th	2nd	1st	2nd	7th	

Maximum Deviation of 35 (5.00) Decibels

Between 50° 70% and (70° 50%[1 & 2]
(70° 65%

Subject 13

Left Ear without Masking

TABLE XXXVI

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	5	20	10	10	5	10	5	15
250	- 5	0	- 5	- 5	- 5	5	- 5	10
500	0	15	5	15	0	5	0	15
1000	10	20	10	10	10	20	10	10
2000	10	20	20	10	10	15	10	10
4000	5	30	10	5	5	10	5	25
8000								
Loss in db ≤ Loss Ave. Loss	25 4.16	105 17.50	50 8.33	45 7.50	25 4.16	65 10.83	25 4.16	80 13.33
Rank	1st	7th	5th	4th	1st	6th	1st	

Maximum Deviation of 80 (13.33) Decibels

Between (50° 70% / 70° 50%) 1 & 2 and 70° 65%

Subject 13

Left Ear Bone Conduction

TABLE XXXVII

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	20	20	10	10	15	35	20	25
250	20	15	15	10	20	20	20	10
500	15	15	20	10	15	10	15	10
1000	15	10	15	15	15	10	15	5
2000	30	35	10	25	15	10	30	20
4000	35	45	35	45	35	35	35	10
8000	10	10	20	25	5	0	10	25
Loss in db $\leq$ Loss Ave. Loss	145 20.71	150 21.42	125 17.85	140 20.00	120 17.14	120 17.14	145 20.71	30 4.28
Rank	5th	7th	3rd	4th	1st	1st	5th	

Maximum Deviation of 30 (4.28) Decibels

Between (50° 70% / 20° 80%) and 70° 65%.

Subject 13

Right Ear

TABLE XXXVIII

Subject 14

1. Medical Findings

   a. Physical Examination

      Age: 19

      Height: 68"

      Weight: 142

      Heart and lungs: Normal

      Chest X-Ray: Negative

      Extremities: Normal

      Tonsils removed

      Large septal spur right

      Blood pressure: 120/70

   b. Laboratory Examination

      Urinalysis: Albumin trace, otherwise normal

      Red blood count: 4,820,000

      Hemoglobin: 95%

      White blood count: 9850

   c. Oto-rhinolaryngeal Examination

      History: Deafness was noticed in the right ear when subject was in the third grade. No definite history of infection. He has had no trouble with the left ear and no apparent change in the right.

Examination:

Mouth: Teeth are excellent with good occlusion

Throat: Tonsils removed, palate cut high on the right. The nasopharynx is normal. No adenoid tissue, and the eustachian tube orifices appear normal.

Nose: Anterior septal deviation and spur on right, but no symptoms of obstruction.

Sinuses: Clear

Ears: Left tympanum normal. Right tympanum moves readily.

Advice: No treatment for deafness

Diagnosis: Mixed deafness right ear chronic

With the exception of the oto-rhinolaryngeal diagnosis of mixed deafness right ear chronic, the medical findings revealed nothing pertinent to this study.

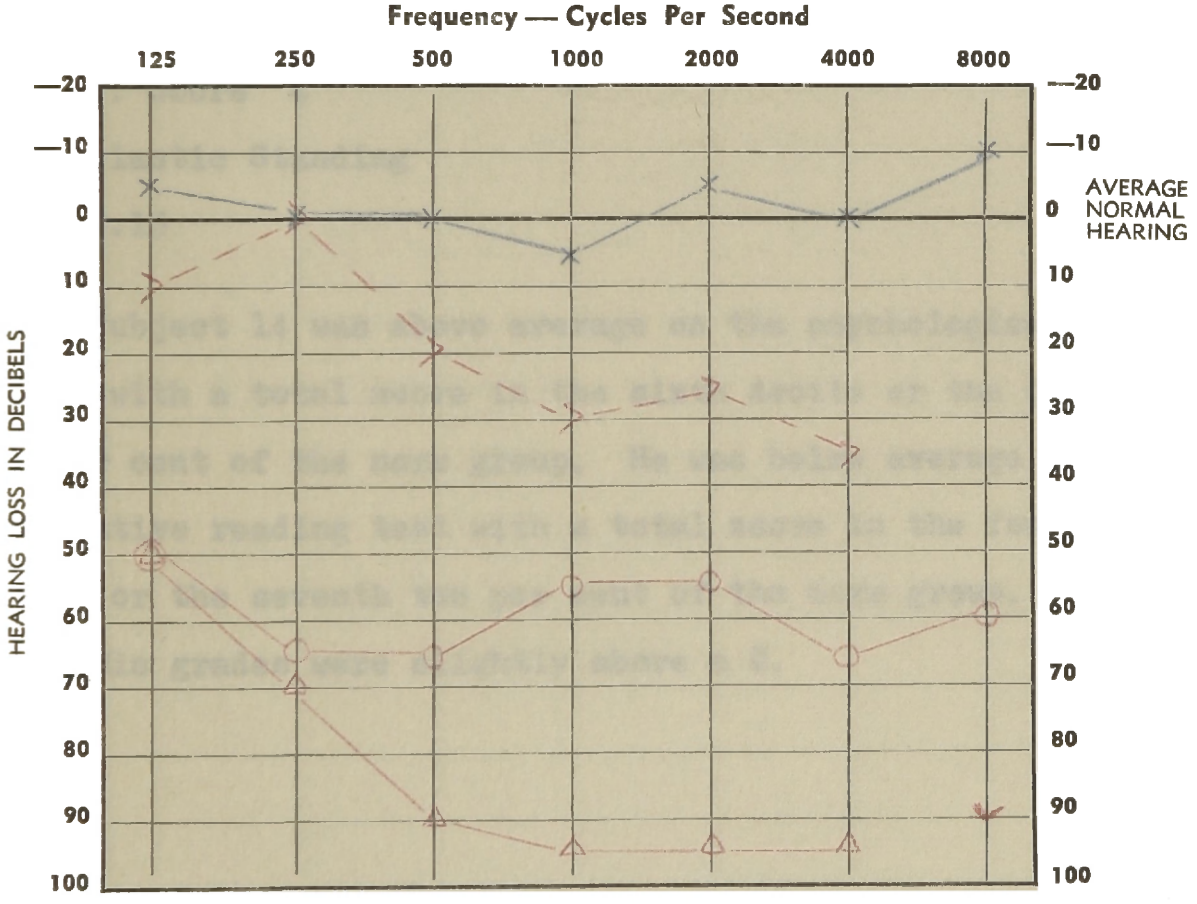
Audiogram 108

Date 11/1/51 Time 2:00 P.M.

Name Subject 14 Test Clinic

	Inside Room	Outside
Temperature		39° F.
Relative Humidity		48%
Barometric Pressure		29.21

Wind W 9



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

2. Test Scores

Psychological Examinations

Q. Score 6

L. Score 6

T. Score 6

Cooperative Test of Reading Comprehension

V. Score 7

R. Score 2

C. Score 2

T. Score 4

3. Scholastic Standing

2.13

Subject 14 was above average on the psychological examination with a total score in the sixth decile or the fifth ten per cent of the norm group. He was below average on the cooperative reading test with a total score in the fourth decile or the seventh ten per cent of the norm group.

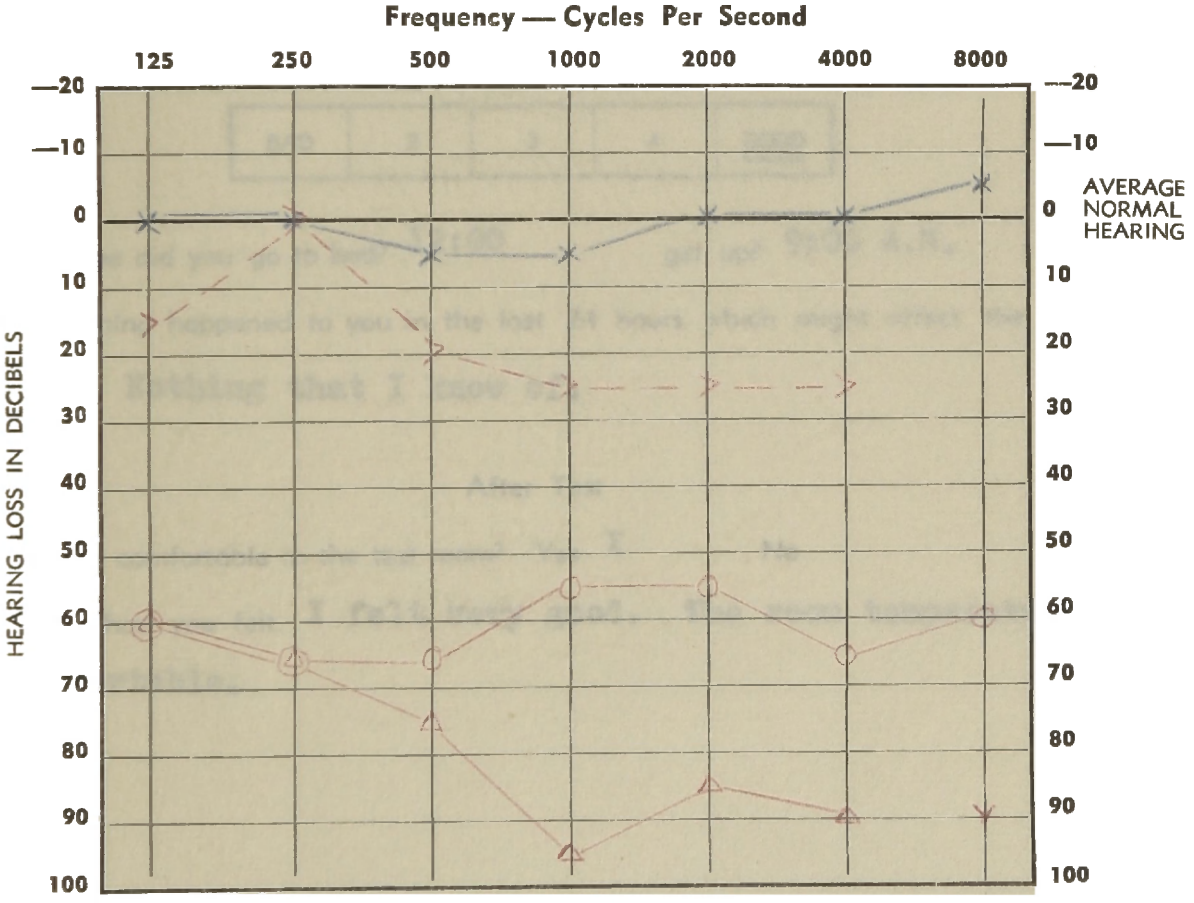
His grades were slightly above a C.

Audiogram 109

Date 4/7/52 Time 1:00 P.M.

Name Subject 14 Test 1

	Inside Room	Outside
Temperature	70° F.	37° F.
Relative Humidity	50%	62%
Barometric Pressure	29.35 Steady	29.17 Steady
Wind		WNW 18



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/7/52	Time	1:00 P.M.
Name	Subject 14	Test	1
	Before Test		After Test
Pulse	72		72
Temperature	97.6°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. The weather is nice and sunny, and I feel swell. Probably due to Spring and the starting of a new term.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 12:00 get up? 9:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing that I know of.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I felt very good. The room temperature was comfortable.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

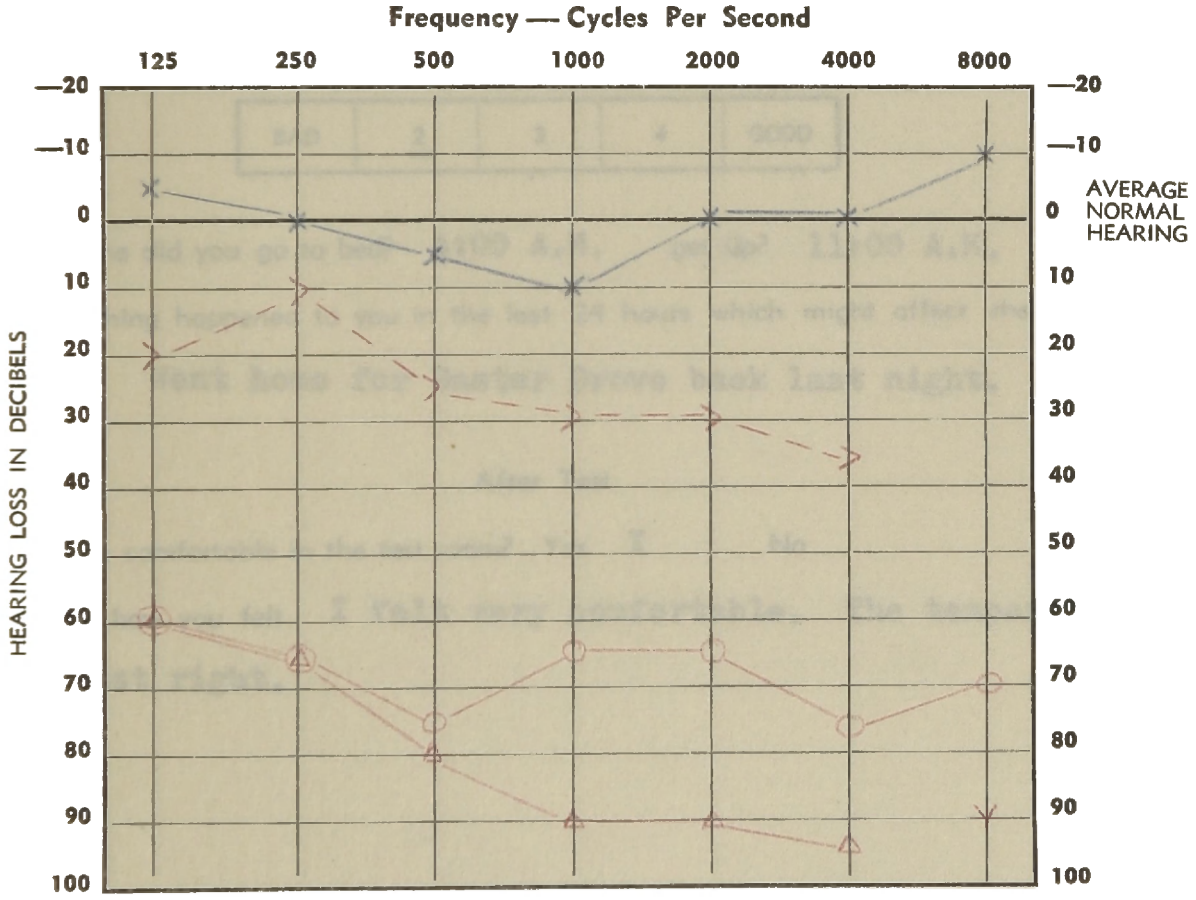
Questionnaire 94

Audiogram 110

Date 4/14/52 Time 1:00 P.M.

Name Subject 14 Test 2

	Inside Room	Outside
Temperature	70° F.	37° F.
Relative Humidity	65%	91% Raining
Barometric Pressure	28.97 Steady	28.82 Steady
Wind		NNW 19



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/14/52	Time	1:00 P.M.
Name	Subject 14	Test	2
	Before Test		After Test
Pulse	64		64
Temperature	97.4°		98.2°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. A little tired.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 4:00 A.M. get up? 11:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Went home for Easter Drove back last night.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I felt very comfortable. The temperature seemed just right.

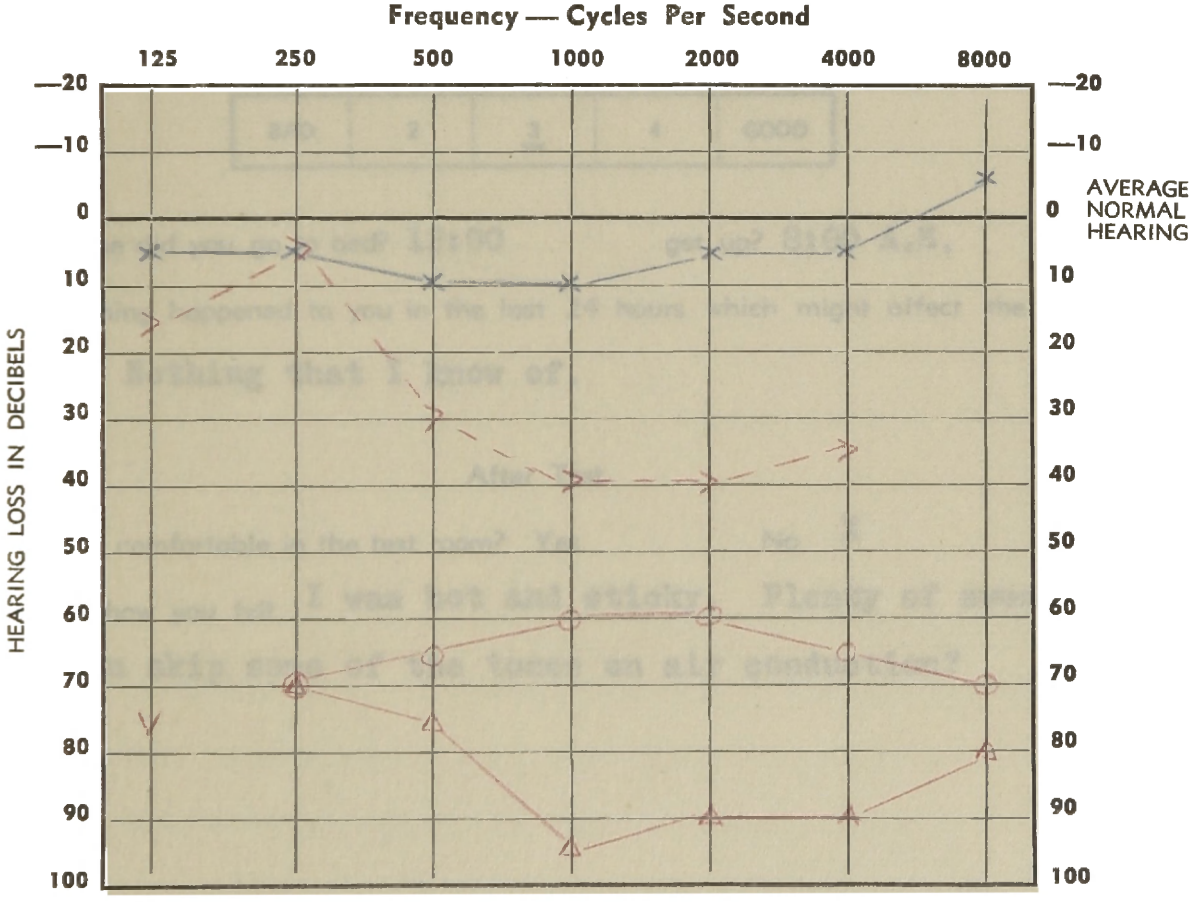
8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

Audiogram 111

Date 4/24/52 Time 4:00 P.M.

Name Subject 14 Test 3

	Inside Room	Outside
Temperature	90° F.	59° F.
Relative Humidity	65%	29%
Barometric Pressure	29.33 Falling	29.20 Falling
Wind		ENE 19



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/24/52	Time	4:00 P.M.
Name	Subject 14	Test	3
	Before Test		After Test
Pulse	72		76
Temperature	97.6°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. I feel wide awake. Just a little stiff from playing softball.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		X		

4. What time did you go to bed? 12:00 get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing that I know of.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was hot and sticky. Plenty of sweat. Didn't you skip some of the tones on air conduction?

8. Comments by operator: Consistent threshold at each frequency. No response at 125 cycles, right ear. Signal lights: No delay. Profuse sweating.

Questionnaire 96

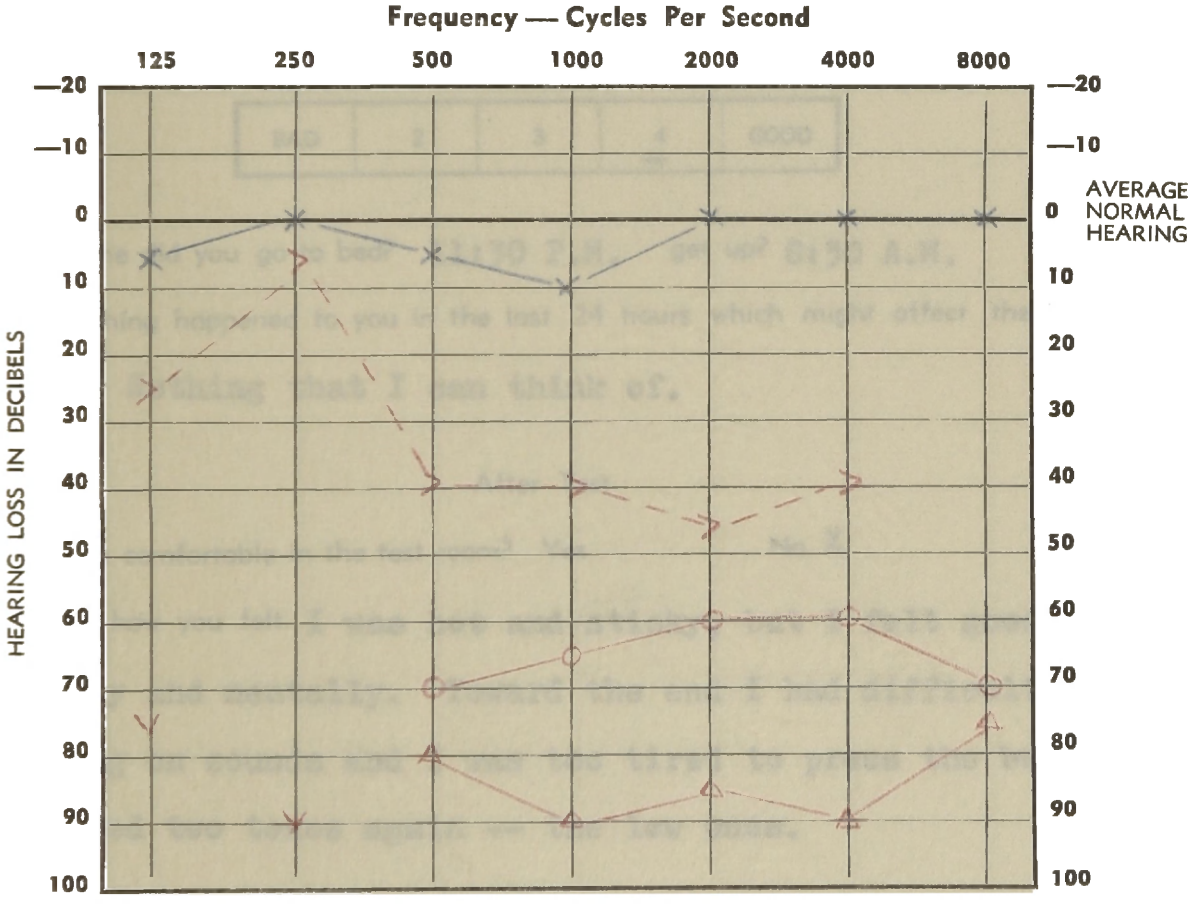
Audiogram 112

Date 4/28/52 Time 4:30 P.M.

Name Subject 14 Test 4

	Inside Room	Outside
Temperature	90° F.	69° F.
Relative Humidity	80%	44%
Barometric Pressure	29.20 Rising	28.98 Rising

Wind N 20



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	4/28/52	Time	4:30 P.M.
Name	Subject 14	Test	4
	Before Test		After Test
Pulse	72		80
Temperature	97°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			—	

2. Describe how you feel. I feel good, just a little worried about a test tomorrow.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
			—	

4. What time did you go to bed? 11:30 P.M. get up? 8:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing that I can think of.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. I was hot and sticky, but I felt good both physically and mentally. Toward the end I had difficulty concentrating on sounds and I was too tired to press the button. You skipped two tones again -- the low ones.

8. Comments by operator: Signal lights: 6 to 8 seconds delay on left ear. No response at 125 and 250 cycles, right ear. Profuse sweating.

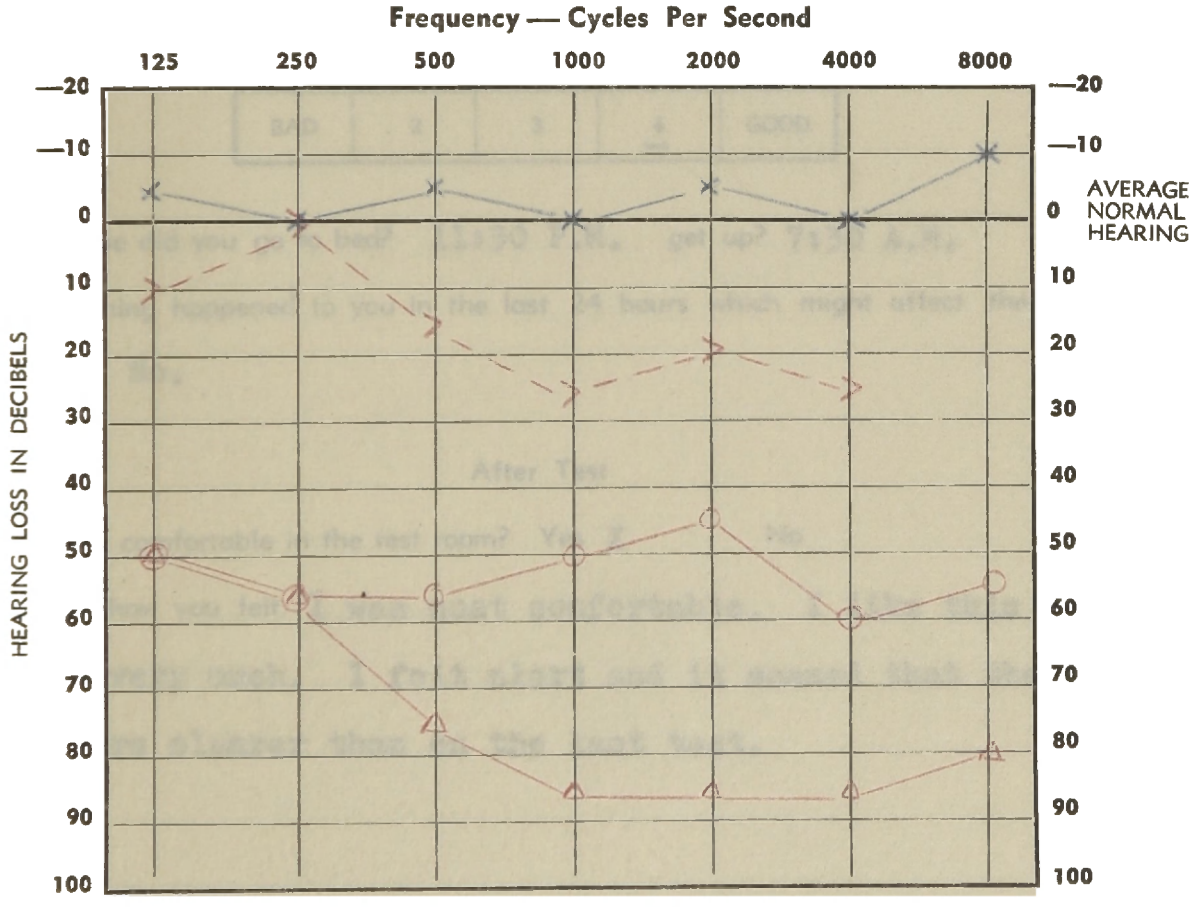
Questionnaire 97

Audiogram 113

Date 5/1/52 Time 9:00 A.M.

Name Subject 14 Test 5

	Inside Room	Outside
Temperature	50° F.	64° F.
Relative Humidity	70%	55%
Barometric Pressure	29.22 Falling	29.06 Falling
Wind	S 5	



Air Conduction - - - - - -

O Right Ear _____

X Left Ear _____

with masking

△ Right Ear at - - - - 3

□ Left Ear at - - - -

Bone Conduction — — — — —

|> Right Ear - - - -
with masking at 3

<| Left Ear
with masking at - - - -

Date	5/1/52	Time	9:00 A.M.
Name	Subject 14	Test	5
	Before Test		After Test
Pulse	72		72
Temperature	97.8°		98.4°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
			X	

2. Describe how you feel. I feel very good today.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
			X	

4. What time did you go to bed? 11:30 P.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was most comfortable. I like this temperature very much. I felt alert and it seemed that the sounds were clearer than on the last test.

8. Comments by operator: Consistent threshold at each frequency. Signal lights: No delay.

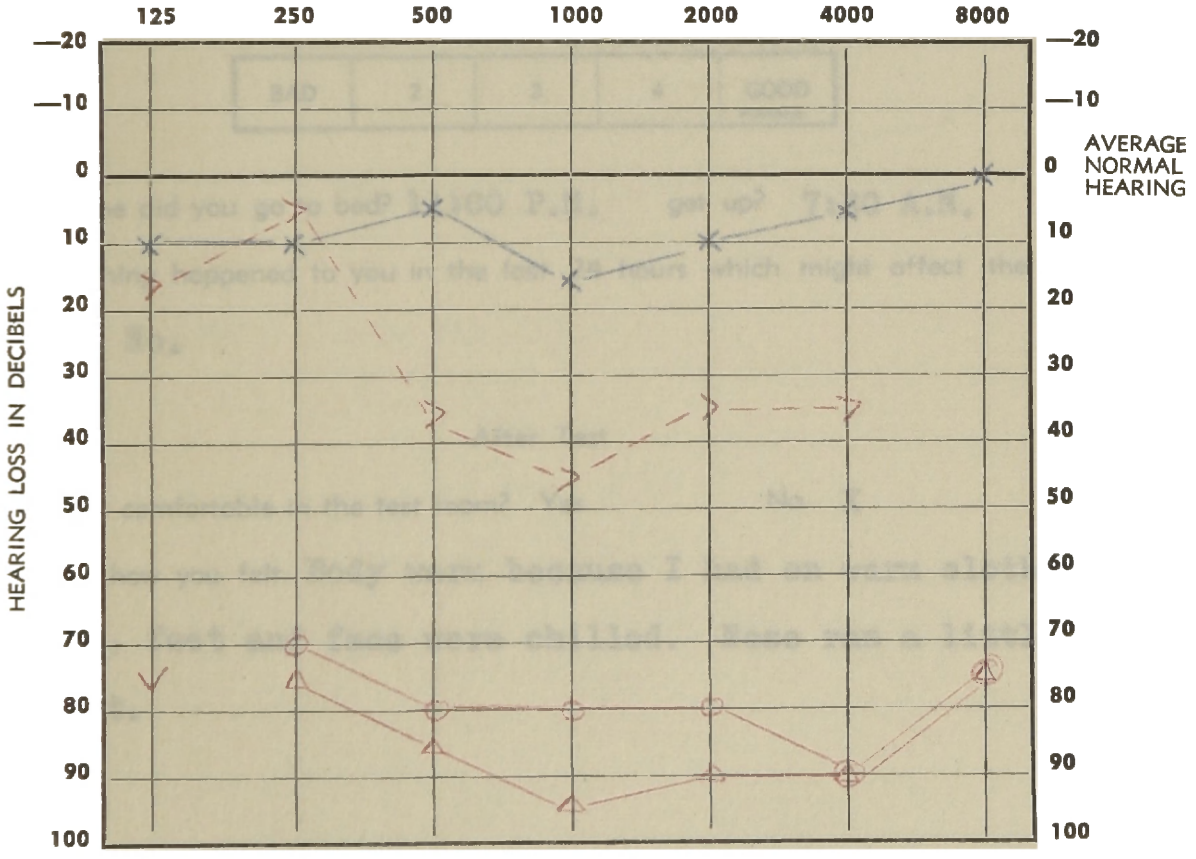
Audiogram 114

Date 5/5/52 Time 4:00 P.M.

Name Subject 14 Test 6

	Inside Room	Outside
Temperature	20° F.	82° F.
Relative Humidity	80%	36%
Barometric Pressure	28.95 Steady	28.79 Steady
Wind		WNW 21

Frequency — Cycles Per Second



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	5/5/52	Time	4:00 P.M.
Name	Subject 14	Test	6
	Before Test		After Test
Pulse	76		84
Temperature	97.8°		98.6°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD

2. Describe how you feel. I feel fine. Had a good night's sleep and I'm wide awake.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD

4. What time did you go to bed? 11:00 P.M. get up? 7:30 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? No.

After Test

6. Were you comfortable in the test room? Yes No X

7. Describe how you felt. Body warm because I had on warm clothing, but hands, feet and face were chilled. Nose ran a little. Felt alert.

8. Comments by operator: Consistent threshold at each frequency. No response at 125 cycles, right ear. Signal lights: No delay. Ears, nose and cheeks red after 20 minutes in test room.

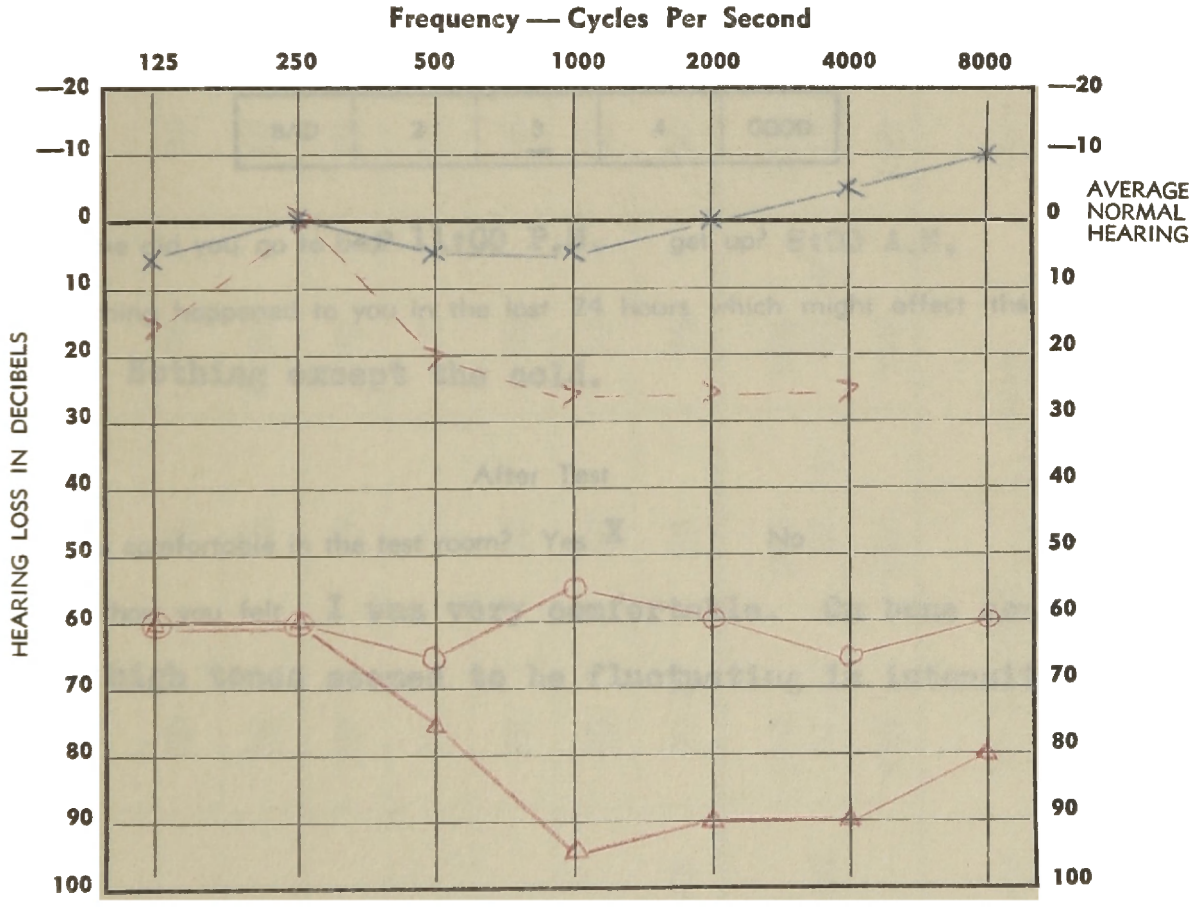
Questionnaire 99

Audiogram 115

Date 5/12/52 Time 9:00 A.M.

Name Subject 14 Test 7

	Inside Room	Outside
Temperature	70° F.	47° F.
Relative Humidity	50%	88% Raining
Barometric Pressure	28.90 Steady	28.70 Steady
		Wind WSW 13



Air Conduction

O Right Ear

X Left Ear

with masking

△ Right Ear at 3

□ Left Ear at

Bone Conduction

|> Right Ear with masking at 3

<| Left Ear with masking at

Date	5/12/52	Time	9:00 A.M.
Name	Subject 14	Test	7
	Before Test		After Test
Pulse	76		76
Temperature	97.6°		97.8°

1. Subjective Feeling of Well Being. Check one box.

BAD	2	3	4	GOOD
		—		

2. Describe how you feel. I have a slight cold. Right side of head seems heavy.

3. Did you sleep well last night? Check one box.

BAD	2	3	4	GOOD
		—		

4. What time did you go to bed? 11:00 P.M. get up? 8:00 A.M.

5. Has anything happened to you in the last 24 hours which might affect the results of the test? Nothing except the cold.

After Test

6. Were you comfortable in the test room? Yes X No

7. Describe how you felt. I was very comfortable. On bone conduction the high tones seemed to be fluctuating in intensity.

8. Comments by operator: Consistent threshold at each frequency, air conduction. Inconsistent thresholds on bone conduction. Signal lights: No delay on air conduction, but flickering on bone conduction.

Questionnaire 100

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	60	60	75	75	50	75	60	25
250	65	65	70	90	55	75	60	35
500	75	80	75	80	75	85	75	10
1000	95	90	95	90	85	95	95	10
2000	85	90	90	85	85	90	90	5
4000	90	95	90	90	85	90	90	10
8000	90 NR	90 NR	80	75	80	75	80	15
Loss in db Σ Loss Ave. Loss	560 80.00	570 81.42	575 82.14	585 83.57	515 73.57	585 83.57	550 78.57	70 10.00
Rank	3rd	4th	5th	7th	1st	7th	2nd	

Maximum Deviation of 70 (10.00) Decibels

Between 50° 70% and (20° 80%
(90° 80%

Subject 14

Right Ear with Masking

TABLE XXXIX

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	60	60	75	75	50	75	60	25
250	65	65	70	90	55	70	60	35
500	65	75	65	70	55	80	65	25
1000	55	65	60	65	50	80	55	30
2000	55	65	60	60	45	80	60	35
4000	65	75	65	60	60	90	65	30
8000	60	70	70	70	55	75	60	20
Loss in db Σ Loss Ave. Loss	425 60.71	475 67.85	465 66.42	490 70.00	370 52.85	550 78.57	425 60.71	180 25.71
Rank	2nd	5th	4th	6th	1st	7th	2nd	

Maximum Deviation of 180 (25.71) Decibels Subject 14

Between 50° 70% and 20° 80% Right Ear without Masking

TABLE XL

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	15	20	15	25	10	15	15	15
250	0	10	5	5	0	5	0	10
500	20	25	30	40	15	35	20	25
1000	25	30	40	40	25	45	25	20
2000	25	30	40	45	20	35	25	25
4000	25	35	35	35	25	35	25	10
8000								
Loss in db Σ Loss Ave. Loss	110 18.33	150 25.00	165 27.50	190 31.66	95 15.83	170 28.33	110 18.33	95 15.83
Rank	2nd	4th	5th	7th	1st	6th	2nd	

Maximum Deviation of 95 (15.83) Decibels Subject 14

Between 50° 70% and 90° 80% Right Ear Bone Conduction

TABLE XLI

	TEST 1 70° F. 50%	TEST 2 70° F. 65%	TEST 3 90° F. 65%	TEST 4 90° F. 80%	TEST 5 50° F. 70%	TEST 6 20° F. 80%	TEST 7 70° F. 50%	DEVIATION IN DECIBELS
125	0	- 5	5	5	- 5	10	5	15
250	0	0	5	0	0	10	0	10
500	5	5	10	5	- 5	5	5	15
1000	5	10	10	10	0	15	5	15
2000	0	0	5	0	- 5	10	0	15
4000	0	0	5	0	0	5	- 5	10
8000	- 5	-10	- 5	0	-10	0	-10	10
Loss in db ≤ Loss Ave. Loss	5 .72	0 .00	35 5.00	20 2.86	-25 - 3.57	55 7.86	0 0	80 11.42
Rank	4th	2nd	6th	5th	1st	7th	2nd	

Maximum Deviation of 80 (11.42) Decibels Subject 14

Between 50° 70% and 20° 80%. Left Ear

TABLE XLII

CHAPTER IV

ANALYSIS OF DATA

The data, which were recorded during the testing periods on audiograms, questionnaires and summary tables, are tabulated in three categories.

A. The Hearing Acuity of the Fourteen Separate Subjects as Measured in the Seven Combinations of Temperature and Relative Humidity.

B. Other Physiological Reactions Measured During the Testing Period Which May Have Affected the Hearing Acuity.

C. Observations and Subjective Evaluations of the Subjects and the Operator.

A. The Hearing Acuity of Fourteen Separate Subjects as Measured in the Seven Combinations of Temperature and Relative Humidity.

NORMAL GROUP

1. Individual scores of each of the seven tests arranged by average decibel loss from the minimum to the maximum loss.

Subject 1

Right Ear		Left Ear	
50°70%	-10.71 db[49]	50°70%	-11.42 db
70°50%(1)	- 8.57	70°50%(1)	- 7.86
70°50%(2)	- 7.14	70°50%(2)	- 7.86
90°80%	- 7.14	90°65%	- 7.86
20°80%	- 6.42	70°65%	- 7.14
70°65%	- 5.71	20°80%	- 6.42
90°65%	- 5.71	90°80%	- 6.42
Maximum deviation[50]	5.00 db	Maximum deviation	5.71 db

[49]It should be remembered that a minus hearing loss indicates hearing acuity better than the normal threshold for adults as designated by zero on the audiogram.

[50]Difference.

Subject 2

Right Ear		Left Ear	
50°70%	- 5.00 db	50°70%	- 6.42 db
70°50%(2)	- 2.86	70°65%	- 3.57
70°65%	- 2.14	70°50%(1)	- 2.14
20°80%	.00	70°50%(2)	- 2.14
90°65%	1.43	90°65%	- 1.43
90°80%	2.14	90°80%	.72
70°50%	3.57	20°80%	.72
Maximum deviation	8.57 db	Maximum deviation	7.14 db

Subject 3

Right Ear		Left Ear	
70°50%(1)	- 4.28 db	70°50%(1)	- 1.42 db
50°70%	- 3.57	70°65%	- .72
70°65%	- 2.86	90°65%	- .72
90°80%	- 2.86	90°80%	.00
70°50%(2)	- 2.14	50°70%	.00
90°65%	- 2.14	70°50%(2)	4.28
20°80%	- .72	20°80%	5.00
Maximum deviation	3.57 db	Maximum deviation	6.42 db

Subject 4

Right Ear		Left Ear	
50°70%	- 2.14 db	50°70%	- 2.14 db
90°65%	1.43	70°65%	- 2.14
70°50%(1)	2.14	70°50%(1)	.00
70°50%(2)	2.14	70°50%(2)	.00
70°65%	2.14	90°65%	.00
20°80%	3.57	90°80%	2.14
90°80%	4.28	20°80%	2.86
Maximum deviation	6.42 db	Maximum deviation	5.00 db

Subject 5

Right Ear		Left Ear	
50°70%	-10.71 db	50°70%	1.42 db
70°50%(2)	- 7.86	70°50%(1)	2.86
70°50%(1)	- 7.14	70°50%(2)	3.57
70°65%	- 4.28	70°65%	5.00
90°80%	- 4.28	90°65%	5.71
20°80%	- 3.57	90°80%	9.28
90°65%	- 2.86	20°80%	9.28
Maximum deviation	7.86 db	Maximum deviation	7.86 db

Subject 6

Right Ear		Left Ear	
50°70%	- 5.00 db	70°70%	- 7.86 db
90°65%	- 2.14	70°50%(2)	- 7.14
70°50%(2)	- .72	70°65%	- 6.42
70°65%	- .72	90°65%	- 6.42
70°50%(1)	.72	70°50%(1)	- 3.57
90°80%	.72	20°80%	- 3.57
20°80%	2.14	90°80%	- 2.86
Maximum deviation	7.14 db	Maximum deviation	5.00 db

Subject 7

Right Ear		Left Ear	
50°70%	- 9.28 db	50°70%	- 9.28 db
70°50%(1)	- 7.86	70°50%(2)	- 9.28
70°50%(2)	- 5.71	70°65%	- 7.86
70°65%	- 5.71	70°50%(1)	- 6.42
20°80%	- 5.71	20°80%	- 5.71
90°65%	.72	90°65%	2.86
90°80%	5.00	90°80%	8.57
Maximum deviation	14.28 db	Maximum deviation	17.85 db

2. Comparison of minimum and maximum hearing loss for all seven normal subjects, right ear.

Subject	Minimum Loss		Maximum Loss		Deviation
1	50°70%	-10.71	90°65%	-5.71	5.00 db
			70°65%	-5.71	
2	50°70%	- 5.00	70°50%(1)	3.57	8.57
3	70°50%(1)	- 4.28	20°80%	- .72	3.57
4	50°70%	- 2.14	90°80%	4.28	6.42
5	50°70%	-10.71	90°75%	-2.86	7.86
6	50°70%	- 5.00	20°80%	2.14	7.14
7	50°70%	- 9.28	90°80%	5.00	14.28

Six of the seven audiometric measurements were best, that is, the hearing loss was least, at 50°70% with deviations or differences between tests ranging from 5.00 to 14.28 decibels. Average minimum loss: 8.21 decibels.

One of the seven audiometric measurements was best at 70°50%(1) with a deviation of 3.57 decibels. Average minimum loss: 3.57 decibels.

Two of the seven audiometric measurements were poorest, that is, the hearing loss was greatest, at 90°80% with deviations ranging from 6.42 to 14.28 decibels. Average maximum loss: 10.35 decibels.

Two of the seven audiometric measurements were poorest at 20°80% with deviations of 3.57 and 7.14 decibels. Average maximum loss: 5.36 decibels.

One of the seven audiometric measurements was poorest at 90°65% with a deviation of 7.86 decibels. Maximum loss: 7.86 decibels.

One of the seven audiometric measurements was poorest at both 90°65% and 70°65% with a deviation of 5.00 decibels. Maximum loss: 5.00 decibels.

One of the seven audiometric measurements was poorest at 70°50%(1) with a deviation of 9.29 decibels. Maximum loss: 9.29 decibels.

Best Score (Minimum Loss)

No. of Subjects	Test	Deviation
6	50°70%	8.21 db
1	70°50%(1)	3.57

Poorest Score (Maximum Loss)

2	90°80%	10.35
2	20°80%	5.36
1	90°65%	7.86
1	90°65%	
	70°65%	5.00
1	70°50%(1)	9.29

Five of the seven audiograms had deviations or differences between maximum and minimum loss greater than the 5 db normally expected.[51]

Subject 3	3.57 db
Subject 1	5.00
Subject 4	6.42
Subject 6	7.14
Subject 5	7.86
Subject 2	8.57
Subject 7	14.28

[51]The 5 db deviation normally expected is discussed in the study of Harris. (See p. 2.)

Comparison of minimum and maximum loss, left ear:

Subject	Minimum Loss		Maximum Loss		Deviation
1	50°70%	-11.42	90°80%	-5.71	5.71 db
2	50°70%	- 6.42	90°80%	.72	7.14
			20°80%	.72	
3	70°50%(1)	- 1.43	20°80%	5.00	6.43
4	50°70%	- 2.14	20°80%	2.86	5.00
	70°65%	- 2.14			
5	50°70%	1.42	90°80%	9.28	7.86
			20°80%	9.28	
6	50°70%	- 7 86	90°80%	-2.86	5.00
7	50°70%	- 9.28	90°80%	8.57	17.85
	70°50%(2)	- 9.28			

Four of the seven audiometric measurements were best, that is, the hearing loss was least, at 50°70% with deviations ranging from 5.00 to 7.86 decibels. Average minimum loss: 6.93 decibels.

One of the seven audiometric measurements was best at both 50°70% and 70°65% with a deviation of 5.00 decibels. Minimum loss: 5.00 decibels.

One of the seven audiometric measurements was best at 70°50%(1) with a deviation of 6.42 decibels. Minimum loss: 5.00 decibels.

One of the seven audiometric measurements was best at both 50°70% and 70°50%(2) with a deviation of 17.85 decibels. Minimum loss: 5.00 decibels.

Three of the seven audiometric measurements were poorest, that is, the hearing loss was greatest, at 90°80% with deviations ranging from 5.00 to 17.85 decibels. Average maximum loss: 9.52 decibels.

Two of the seven audiometric measurements were poorest at both 90°80% and 20°80% with deviations ranging from 7.14 to 7.86. Average maximum loss: 7.50 decibels.

Two of the seven audiometric measurements were poorest at 20°80% with deviations ranging from 5.00 to 6.43 decibels. Average maximum loss: 5.71 decibels.

Best Score (Minimum Loss)

No. of Subjects	Test	Deviation
4	50°70%	6.93 db
1	50°70% 70°65%	5.00
1	70°50%(1)	6.42
1	50°70% 70°50%(2)	17.85

Poorest Score (Maximum Loss)

3	90°80%	9.52
2	90°80% 20°80%	7.50
2	20°80%	5.71

Five of the seven subjects had deviations greater than the 5 db normally expected.

Subject 6	5.00 db
Subject 4	5.00
Subject 1	5.71
Subject 3	6.43
Subject 2	7.14
Subject 5	7.86
Subject 7	17.85

Summary of comparison of minimum and maximum hearing loss, normal group, both ears.

Ten of the fourteen audiometric measurements (counting the right and left ears individually) were best, that is, the hearing loss was least, at 50°70% with deviations or differences between the minimum and maximum losses ranging between 5.00 and 14.28 decibels. Average minimum loss: 7.70 decibels.

Two of the fourteen audiometric measurements were best at 70°50%(1) with deviations of 3.57 and 6.42 decibels. Average minimum loss: 5.00 decibels.

One of the fourteen audiometric measurements was best at both 50°70% and 70°65% with a deviation of 5.00 decibels. Minimum loss: 5.00 decibels.

One of the audiometric measurements was best at both 50°70% and 70°50%(2) with a deviation of 17.85 decibels. Minimum loss: 5.00 decibels.

Five of the fourteen audiometric measurements were poorest, that is, the hearing loss was greatest, at 90°80% with deviations or differences between the minimum and maximum losses ranging from 5.00 to 17.85 decibels. Average maximum loss: 9.85 decibels.

Four of the fourteen audiometric measurements were poorest at 20°80% with deviations ranging from 3.57 to 7.14 decibels. Average maximum loss: 5.53 decibels.

Two of the fourteen audiometric measurements were poorest at both 90°80% and 20°80% with deviations of 7.14 and 7.86 decibels. Average maximum loss: 7.50 decibels.

One of the fourteen audiometric measurements was poorest at 90°65% with a deviation of 7.86 decibels. Maximum loss: 7.86 decibels.

One of the fourteen audiometric measurements was poorest at both 90°65% and 70°65% with a deviation of 5.00 decibels. Maximum loss: 5.00 decibels.

One of the fourteen audiometric measurements was poorest at 70°50%(1) with a deviation of 9.29 decibels. Maximum loss: 9.29 decibels.

Mimimum Loss

No. of Measurements	Test	Deviation
10	50°70%	7.70 db
2	70°50%(1)	5.00
1	50°70%	
	70°65%	5.00
1	70°50%(2)	
	50°70%	17.85

Maximum Loss

5	90°80%	9.85
4	20°80%	5.53
2	90°80%	
	20°80%	7.50
1	90°65%	7.86
1	90°65%	
	70°65%	5.00
1	70°50%(1)	9.29

3. Comparison of first and second rank scores, right ear.

A comparison of the minimum and maximum loss of the seven subjects with normal hearing indicates that ten of the fourteen audiometric measurements (counting the right and left ears individually) were best in the combination of 50°70%. Two additional measurements were best at both 50°70% and 70°50%(2) or 70°65%, thus bringing the total to twelve measurements best to 50°70%. This is in accordance with the studies of Huntington[52] who stated that individuals have two temperature and humidity optima, mental and physical. The combination 50°70% corresponds to the mental optimum. The purpose of the following comparison is to determine whether the second best performance occurred at the physical optimum of 70° and a humidity range from 50% to 65%.

Subject	1st		2nd		Deviation
1	50°70%	-10.71	70°50%(2)	-8.57	2.14 db
2	50°70%	- 5.00	70°50%(2)	-2.86	2.14
3	70°50%(1)	- 4.28	50°70%	-3.57	.72
4	50°70%	- 4.14	90°65%	1.43	3.57
5	50°70%	-10.71	70°50%(2)	-7.86	2.86
6	50°70%	- 5.00	90°65%	-2.14	2.86
7	50°70%	- 9.28	70°50%	-7.86	1.43

Six of the seven audiometric measurements were best at 50°70% with deviations ranging from 1.43 to 2.57 decibels, an average gain of only 2.50 decibels over the second place score.

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[52]See pp. 18-20.

One of the seven audiometric measurements was best at 70°50%(1) with a deviation of .72 decibels, a gain of only .72 decibels over second place score.

Four of the seven audiometric measurements ranked second at 70°50%(2) with deviations ranging from 1.43 to 2.86 decibels, an average loss of 2.14 decibels from the average best score.

Two of the seven audiometric measurements ranked second at 90°65% with deviations of 2.86 and 3.57 decibels, an average loss of 3.21 decibels from the average best score.

One of the seven audiometric measurements ranked second at 50°70% with a deviation of .72 decibels, a loss of .72 decibels from the average best score.

No. of Subjects	Rank	Test	Deviation
6	1st	50°70%	2.50 db
1	1st	70°50%(1)	.72
4	2nd	70°50%(2)	2.14
2	2nd	90°65%	3.21
1	2nd	50°70%	.72

Four of the seven audiometric measurements were second at Huntington's physical optimum of 70° and a humidity range of 50% to 65%. One was first at 70°50%.

One of the seven audiometric measurements was second at the mental optimum of 50°70%.

All seven of the subjects had deviations less than the 5 decibels normally expected.

Subject 3	.72 db
Subject 7	1.43
Subject 1	2.14
Subject 2	2.14
Subject 5	2.86
Subject 6	2.86
Subject 4	3.57

Comparison of first and second rank scores, left ear.

Subject	1st		2nd		Deviation
1	$50^{\circ}70\%$	-11.42	$70^{\circ}50\%(1)$	-7.86	3.57 db
			$70^{\circ}50\%(2)$	-7.86	
2	$50^{\circ}70\%$	- 6.42	$70^{\circ}65\%$	-2.14	4.29
3	$70^{\circ}50\%(1)$	- 1.43	$70^{\circ}65\%$	- .72	.72
			$90^{\circ}65\%$	- .72	
4	$50^{\circ}70\%$	- 2.14	$70^{\circ}50\%(1)$	.00	2.14
	$70^{\circ}65\%$	- 2.14	$70^{\circ}50\%(2)$	.00	
5	$50^{\circ}70\%$	1.43	$70^{\circ}50\%(2)$	2.86	1.43
6	$50^{\circ}70\%$	- 7.86	$70^{\circ}50\%(2)$	-7.14	.72
7	$50^{\circ}70\%$	- 9.28	$70^{\circ}65\%$	-7.86	1.43
	$70^{\circ}50\%(2)$	- 9.28			

Four of the seven audiometric measurements were best at $50^{\circ}70\%$ with deviations ranging from .72 to 4.29 decibels, an average gain of only 2.50 decibels over 2nd place score.

One of the seven audiometric measurements was best at both $50^{\circ}70\%$ and $70^{\circ}50\%(2)$ with a deviation of 1.43 decibels, a gain of only 1.43 decibels over 2nd place score.

One of the seven audiometric measurements was best at both $50^{\circ}70\%$ and $70^{\circ}65\%$ with a deviation of 2.14 decibels, a gain of only 2.14 decibels over the 2nd place score.

One of the seven audiometric measurements was best at $70^{\circ}50\%(1)$ with a deviation of .72 decibels, a gain of only .72 decibels over 2nd place score.

Two of the seven audiometric measurements were second at 70°50%(2) with deviations ranging from .72 to 1.43 decibels, an average loss of 1.07 decibels from average best score.

Two of the seven audiometric measurements were second at 70°65% with deviations ranging from 1.43 to 4.29 decibels, an average loss of 2.86 decibels from the average best score.

Two of the seven audiometric measurements were second at both 70°50%(1) and 70°50%(2) with deviations ranging from 2.14 to 3.57 decibels, an average loss of 2.86 decibels from the average best score.

One of the seven audiometric measurements was second at both 70°65% and 90°65% with a deviation of 1.43 decibels, a loss of 1.43 decibels from the average best score.

No. of Subjects	Rank	Test	Deviation
4	1st	50°70%	2.50 db
1	1st	50°70% 70°50%(1)	1.43
1	1st	50°70% 70°65%	2.14
1	1st	70°50%(1)	.72
2	2nd	70°50%(2)	1.07
2	2nd	70°65%	2.86
2	2nd	70°50%(1) 70°50%(2)	2.86
1	2nd	70°65% 90°65%	1.43

Six of the seven audiometric measurements were second at Huntington's physical optimum of 70° and a humidity range of 50% to 65%. One was first at 70°50%.

All seven of the subjects had deviations less than the 5 decibels normally expected.

Subject 3	.72 db
Subject 6	.72
Subject 7	1.43
Subject 5	1.43
Subject 4	2.14
Subject 1	3.57
Subject 2	4.29

Summary of first and second rank scores, both ears.

The results were in accordance with the theory of Huntington, for twelve of the fourteen audiometric measurements were best at $50^{\circ}70\%$, the mental optimum, while twelve were second at $70^{\circ}50\%$ and $70^{\circ}65\%$, the physical optimum. Subjects 4 and 6 scored second at $90^{\circ}65\%$; otherwise all first and second place scores were within either the mental or the physical optimum.

4. Comparison of test scores at $90^{\circ}80\%$ and $20^{\circ}80\%$.

A comparison of the minimum and maximum loss (p. 357) indicates that eleven of the fourteen audiometric measurements for the normal group had maximum losses at either $90^{\circ}80\%$ or $20^{\circ}80\%$. The purpose of the following comparison is to determine the hearing acuity of the normal subjects in combinations of constant humidity, but different temperatures.

Right Ear

Subject	90°80%	20°80%	Deviation
1	-7.14	-6.42	.72 db
2	2.14	.00	2.14
3	2.86	- .72	2.14
4	4.28	3.57	.72
5	-4.28	-3.57	.72
6	.72	2.14	1.43
7	5.00	-5.71	10.71

Three of the seven audiometric measurements were better, that is, the hearing loss was less, at 90°80% with deviations or differences between the two combinations ranging from .72 to 1.43 decibels, an average gain of only .95 decibels over 20°80%.

Four of the seven audiometric measurements were better at 20°80% with deviations ranging from .72 to 10.71 decibels, an average gain of only 3.93 decibels over 90°80%.

Number	Better Score	Average Gain
3	90°80%	.95 db
4	20°80%	3.93

Only one of the seven subjects had a deviation greater than the 5 decibels normally expected.

Subject 1	.72 db
Subject 4	.72
Subject 5	.72
Subject 6	1.43
Subject 2	2.14
Subject 3	2.14
Subject 7	10.71

Left Ear

Subject	90°80%	20°80%	Deviation
1	-5.71	-6.42	.72 db
2	.72	.72	.00
3	.00	5.00	5.00
4	2.14	2.86	.72
5	9.28	9.28	.00
6	-2.86	-3.57	.72
7	8.57	-5.71	14.29

Two of the seven audiometric measurements were better, that is, the hearing loss was less, at 90°80% with deviations or differences between the two test scores ranging from .72 to 5.00 decibels, an average gain of only 2.86 decibels over 20°80%.

Three of the seven audiometric measurements were better at 20°80% with deviations ranging from .72 to 14.29 decibels, an average gain of 5.24 decibels over 90°80%.

Two of the seven audiometric measurements had the same loss at 20°80% and at 90°80%.

Number	Better Score	Average Gain
2	90°80%	2.86 db
3	20°80%	5.24
2	No change	No change

Only one of the seven subjects had a deviation greater than the 5 db normally expected.

Subject 2	.00 db
Subject 5	.00
Subject 1	.72
Subject 6	.72
Subject 4	.72
Subject 3	5.00
Subject 7	14.29

Summary of comparison of test scores at 90°80% and at 20°80%.

Five of the fourteen audiometric measurements (counting the right and left ear individually) were better, that is, the hearing loss was less at 90°80%, with deviations or differences between the two tests ranging from .72 to 5.00 decibels, an average gain of only 1.72 decibels over 20°80%.

Seven of the fourteen audiometric measurements were better at 20°80% with deviations ranging from .72 to 14.29 decibels, an average gain of 4.49 decibels over 90°80%.

Two of the fourteen audiometric measurements had the same loss at both 90°80% and at 20°80%.

Number of Tests	Better Score	Average Gain
5	90°80%	1.72 db
7	20°80%	4.49
2	No change	

5. Comparison of test scores at 90°65% and 90°80%.

In the comparison of 90°80% and 20°80% the humidity was constant but the temperatures were different. The purpose of the following comparison is to determine the hearing acuity of the seven normal subjects in combinations in which

the temperature was constant but the humidity different.

Right Ear

Subject	90°65%	90°80%	Deviation
1	-5.71	-7.14	1.43 db
2	1.43	2.14	.72
3	-2.14	-3.86	.72
4	1.43	4.28	2.86
5	-2.86	-4.28	1.43
6	-2.14	.72	2.86
7	.72	5.00	4.28

Four of the seven audiometric measurements were better, that is, the hearing loss was less, at 90°65% with deviations or differences between the two tests ranging from .72 to 4.28 decibels, an average gain of only 2.68 decibels over 90°80%.

Three of the seven audiometric measurements were better at 90°80% with deviations ranging from .72 to 1.43 decibels, an average gain of only 1.19 decibels over 90°65%.

Number	Better Score	Deviation
4	90°65%	2.68 db
3	90°80%	1.19

All seven subjects had deviations less than the 5 decibels normally expected.

Subject 2	.72 db
Subject 3	.72
Subject 1	1.43
Subject 5	1.43
Subject 4	2.86
Subject 6	2.86
Subject 7	4.28

Left Ear

Subject	90°65%	90°80%	Deviation
1	-7.86	-5.71	2.14 db
2	-1.43	.72	2.14
3	- .72	.00	.72
4	.00	2.14	2.14
5	5.71	9.28	3.57
6	-6.42	-2.86	3.57
7	2.86	8.57	5.71

All seven audiometric measurements were better, that is, the hearing loss was less, at 90°65% with deviations ranging from .72 to 5.71 decibels, an average gain of only 2.86 decibels over 90°80%.

Number	Better Score	Deviation
7	90°65%	2.86
0	90°80%	

Six of the seven subjects had deviations less than the 5 decibels normally expected on successive tests.

Subject 3	.72 db
Subject 1	2.14
Subject 2	2.14
Subject 4	2.14
Subject 5	3.57
Subject 6	3.57
Subject 7	5.71

Summary of comparison of test scores of 90°65% and 90°80%.

Eleven of the fourteen audiometric measurements (counting right and left ears individually) were better,

that is, the hearing loss was less, at 90°65% than at 90°80%. Deviations or differences between the two tests ranged from .72 to 5.71 decibels, an average gain of 2.79 decibels over 90°80%.

Three of the fourteen audiometric measurements were better at 90°80% with deviations ranging from .72 to 1.43 decibels, an average gain of 1.19 decibels over 90°65%.

Number	Better Score	Deviation
11	90°65%	2.79 db
3	90°80%	1.19

6. Comparison of test scores at 70°50%(1) and 70°50%(2).

The series of seven tests began and ended with an identical combination of 70°50%. This permitted checking the validity of the tests and noting the influence of practice among the subjects.

A comparison of the minimum and maximum losses on the seven tests reveals that ten of the fourteen audiometric measurements (counting the right and left ears individually) had deviations greater than the 5 decibels normally expected on a series of successive tests taken by the same subject. (See p. 2.) The purpose of this comparison is to determine if audiograms in identical conditions of temperature and humidity would be accurate consistently to at least 5 decibels.

Right Ear

Subject	70°50%(1)	70°50%(2)	Deviation
1	-7.14	-8.57	1.43 db
2	3.57	-2.86	6.42
3	-4.28	-2.14	2.14
4	2.14	2.14	.00
5	-7.14	-7.86	.72
6	.72	- .72	1.44
7	-5.71	-7.86	2.14

Five of the seven audiometric measurements were better, that is, the hearing loss was less at 70°50%(2) with deviations or differences between the two tests ranging from 1.44 to 6.42 decibels, an average gain of 2.43 decibels over 70°50%(1).

One of the seven audiometric measurements was better at 70°50%(1) with a deviation of 2.14 decibels, a gain of 2.14 decibels over 70°50%(2).

One of the seven subjects had no change.

Number	Better Score	Average Gain
5	70°50%(2)	2.43 db
1	70°50%(1)	2.14
1	No change	

Only one of the seven audiometric measurements had a deviation greater than the 5 decibels normally expected on successive tests.

Subject 4	.00 db
Subject 5	.72
Subject 1	1.43
Subject 6	1.44
Subject 3	2.14
Subject 7	2.14
Subject 2	6.42

Left Ear

Subject	70°50%(1)	70°50%(2)	Deviation
1	-7.86	-7.86	.00 db
2	-2.14	-2.14	.00
3	-1.43	4.28	5.71
4	.00	.00	.00
5	3.57	2.86	.72
6	-3.57	-7.14	3.57
7	-6.42	-9.28	2.86

Three of the seven audiometric measurements were better at 70°50%(2) with deviations ranging from .72 to 3.57 decibels, an average gain of 2.38 decibels over 70°50%(1).

One of the seven audiometric evaluations was better at 70°50%(1) with a deviation of 5.71 decibels, a gain of 5.71 decibels over 70°50%(2).

Three of the seven audiometric measurements had the same loss at 70°50%(1) and 70°50%(2).

Number	Better Score	Deviation
3	70°50%(2)	2.38 db
1	70°50%(1)	5.71
3	No change	

Only one of the seven audiometric measurements had a deviation greater than the 5 decibels normally expected.

Subject 1	.00 db
Subject 2	.00
Subject 4	.00
Subject 5	.72
Subject 7	2.86
Subject 6	3.57
Subject 3	5.71

Summary of comparison of test scores at 70°50%(1) and 70°50%(2).

Eight of the fourteen audiometric measurements (counting the right and left ears individually) were better, that is, the hearing loss was less, at 70°50%(2) with deviations or differences between the two tests ranging from .72 to 6.42 decibels, an average gain of 2.41 decibels over 70°50%(1), well below the limit of significance.

Two of the fourteen audiometric measurements were better at 70°50%(1) with deviations ranging from 2.14 and 5.71 decibels, an average gain of 3.93 decibels over 70°50%(2), still below the significant limit.

Four of the fourteen audiometric measurements had the same loss for both tests.

Number	Better Score	Average Gain
8	70°50%(2)	2.41 db
2	70°50%(1)	3.93
4	No change	

Twelve of the fourteen audiometric measurements had deviations less than the 5 decibels normally expected on successive tests.

HARD-OF-HEARING GROUP

7. Individual scores of each of the seven tests arranged by average decibel loss from the minimum to the maximum loss.

Subject 8

Left Ear with Masking		Left Ear without Masking	
50°70%	27.14 db	50°70%	24.28 db
70°50%(2)	37.14	70°50%(1)	30.00
70°50%(1)	37.14	70°65%	30.71
90°65%	37.14	70°50%(2)	31.42
70°65%	37.86	90°65%	32.86
20°80%	42.15	90°80%	34.28
90°80%	47.14	20°80%	35.00
Maximum deviation	20.00 db	Maximum deviation	10.71 db

Subject 8

Left Ear Bone Conduction		Right Ear	
50°70%	7.50 db	70°50%(2)	5.71 db
70°50%(2)	9.16	50°70%	6.42
70°50%(1)	10.00	90°65%	8.57
20°80%	11.66	90°80%	8.57
90°65%	12.50	70°50%(1)	9.28
90°80%	14.16	20°80%	9.28
70°65%	15.00	70°65%	10.71
Maximum deviation	7.50 db	Maximum deviation	5.00 db

Subject 9

Right Ear with Masking		Right Ear without Masking	
50°70%	32.86 db	50°70%	25.00 db
70°50%(2)	35.71	70°50%(2)	30.00
90°65%	35.71	70°65%	32.86
70°65%	37.14	90°65%	35.71
90°80%	38.57	20°80%	36.42
70°50%(1)	42.86	70°50%(1)	36.42
20°80%	51.42	90°80%	38.57
Maximum deviation	18.56 db	Maximum deviation	13.57 db

Subject 9

Right Ear Bone Conduction		Left Ear	
70°65%	3.33 db	70°50%(1)	2.86 db
50°70%	6.66	90°65%	5.00
90°65%	8.33	70°50%(2)	7.86
90°80%	8.33	70°65%	8.57
70°50%(2)	12.50	50°70%	10.71
70°50%(1)	(16.66	20°80%	10.71
20°80%	(16.66	90°80%	18.57
Maximum deviation	13.33 db	Maximum deviation	15.71 db

Subject 10

Right Ear with Masking		Right Ear without Masking	
70°65%	47.14 db	50°70%	46.42 db
20°80%	48.57	20°80%	47.14
50°70%	49.28	70°65%	47.14
70°50%(2)	50.71	70°50%(2)	48.57
70°50%(1)	53.57	70°50%(1)	48.57
90°65%	55.00	90°80%	50 71
90°80%	60.00	90°65%	51.42
Maximum deviation	13.86 db	Maximum deviation	5.00 db

Subject 10

Right Ear Bone Conduction		Left Ear	
50°70%	3.33 db	(70°50%(2)	- 5.00 db
70°50%(1)	5.83	(70°65%	- 5.00
70°50%(2)	5.83	70°50%(1)	- 4.28
70°65%	8.33	90°65%	- 2.14
90°65%	10.00	50°70%	- 1.43
20°80%	10.00	20°80%	.72
90°80%	20.83	90°80%	.72
Maximum deviation	17.50 db	Maximum deviation	5.72 db

Subject 11

Right Ear with Masking		Right Ear without Masking	
50°70%	25.00 db	70°50%(2)	22.14 db
70°50%(2)	25.71	50°70%	23.57
70°50%(1)	32.86	70°50%(1)	25.00
20°80%	32.86	70°65%	26.42
70°65%	33.57	20°80%	27.85
90°65%	36.42	90°65%	30.71
90°80%	37.14	90°80%	30.71
Maximum deviation	12.14 db	Maximum deviation	8.57 db

Subject 11

Right Ear Bone Conduction		Left Ear	
70°50%(1)	(4.16 db	70°50%(1)	(- 7.14 db
70°50%(2)	(4.16	70°50%(2)	(- 7.14
70°65%	5.83	70°65%	- 7.14
50°70%	5.83	50°70%	- 5.71
20°80%	15.83	90°65%	- 5.00
90°65%	17.50	90°80%	- 5.00
90°80%	22.50	20°80%	.72
Maximum deviation	18.34 db	Maximum deviation	7.86 db

Subject 12

Left Ear with Masking		Left Ear without Masking	
90°80%	57.86 db	70°50%(2)	50.71 db
70°50%(1)	58.57	50°70%	54.28
70°50%(2)	58.57	70°50%(1)	55.71
70°65%	62.14	90°80%	57.14
90°65%	63.57	70°65%	58.57
50°70%	63.57	90°65%	60.00
20°80%	75.71	20°80%	65.71
Maximum deviation	17.86 db	Maximum deviation	15.00 db

Subject 12

Left Ear Bone Conduction		Right Ear	
70°50%(1)	12.50 db	90°80%	12.14 db
70°50%(2)	15.83	70°50%(2)	13.57
70°65%	17.50	50°70%	15.00
50°70%	26.66	70°50%(1)	15.71
90°65%	27.50	70°65%	15.71
90°80%	33.33	90°65%	15.71
20°80%	50.83	20°80%	22.86
Maximum deviation	38.33 db	Maximum deviation	10.71 db

Subject 13

Left Ear with Masking		Left Ear without Masking	
50°70%	20.71 db	50°70%	20.71 db
20°80%	24.28	20°80%	24.28
90°80%	24.28	90°80%	24.28
90°65%	25.00	90°65%	25.00
70°50%(1)	25.71	70°50%(1)	25.71
70°50%(2)	25.71	70°50%(2)	25.71
70°65%	25.71	70°65%	25.71
Maximum deviation	5.00 db	Maximum deviation	5.00 db

Subject 13

Left Ear Bone Conduction		Right Ear	
50°70%	(4.16 db	50°70%	(17.14 db
70°50%(1)	(4.16	20°80%	(17.14
70°50%(2)	(4.16	90°65%	17.85
90°80%	7.50	90°80%	20.00
90°65%	8.33	70°50%(1)	20.17
20°80%	10.83	70°50%(2)	20.17
70°65%	17.50	70°65%	21.42
Maximum deviation	13.33 db	Maximum deviation	4.28 db

Subject 14

Right Ear with Masking		Right Ear without Masking	
50°70%	73.57 db	50°70%	52.85 db
70°50%(1)	78.57	70°50%(2)	60.71
70°50%(2)	80.00	70°50%(1)	60.71
70°65%	81.42	90°65%	66.42
90°65%	82.14	70°65%	67.85
90°80%	83.57	90°80%	70.00
20°80%	83.57	20°80%	78.57
Maximum deviation	10.00 db	Maximum deviation	25.71 db

Subject 14

Right Ear Bone Conduction		Left Ear	
50°70%	15.83 db	50°70%	3.57 db
70°50%(1)	18.33	70°50%(2)	.00
70°50%(2)	18.33	70°65%	.00
70°65%	25.00	70°50%(1)	.72
90°65%	27.50	90°80%	2.86
20°80%	28.33	90°65%	5.00
90°80%	31.66	20°80%	7.86
Maximum deviation	15.83 db	Maximum deviation	11.42 db

8. Comparison of minimum and maximum hearing loss for all seven hard-of-hearing subjects, Poorer Ear with Masking.

Subject	Minimum Loss		Maximum Loss		Deviation
8	50°70%	27.14	90°80%	47.14	20.00 db
9	50°70%	32.86	20°80%	51.42	18.56
10	70°65%	47.14	90°80%	60.00	12.86
11	50°70%	25.00	90°80%	34.14	12.14
12	90°80%	57.86	20°80%	75.71	17.86
13	50°70%	20.71	(70°50%(1) (70°50%(2) (70°65%	25.71	5.00
14	50°70%	73.57	(20°80% (90°80%	83.57	10.00

Five of the seven audiometric measurements were best, that is, the hearing loss was least, at 50°70%, with deviations or differences between the tests ranging from 5.00 to 20.00 decibels. Average minimum loss: 13.14 decibels.

One of the seven audiometric measurements was best at 70°65% with a deviation of 12.86 decibels. Minimum loss: 12.86 decibels.

One of the seven audiometric measurements was best at 90°80% with a deviation of 17.86 decibels. Minimum loss: 17.86 decibels.

Three of the seven audiometric measurements were poorest, that is, the hearing loss was greatest, at 90°80% with deviations or differences between tests ranging from 12.14 to 20.00 decibels. Average maximum loss: 15.00 decibels.

Two of the seven audiometric measurements were poorest at 20°80% with deviations of 17.86 to 18.56. Average maximum loss: 18.21 decibels.

One of the seven audiometric measurements was poorest at 70°50%(1), 70°50%(2) and 70°65% with a deviation of 5.00 decibels. Maximum loss: 5.00 decibels.

One of the seven audiometric measurements was poorest at both 90°80% and 20°80% with a deviation of 10.00 decibels. Maximum loss: 10.00 decibels.

Best Score (Minimum Loss)

No. of Subjects	Test	Deviation
5	50°70%	13.14 db
1	90°80%	17.86
1	70°65%	12.86

Poorest Score (Maximum Loss)

3	90°80%	15.00
2	20°80%	18.21
1	70°50%(1) 70°50%(2) 70°65%	5.00
1	90°80% 20°80%	10.00

Six of the seven audiograms had deviations or differences between minimum and maximum loss greater than the 5 decibels normally expected.

Subject 13	5.00 db
Subject 14	10.00
Subject 11	12.14
Subject 10	12.86
Subject 12	17.86
Subject 9	18.56
Subject 8	20.00

Comparison of minimum and maximum hearing loss, poorer ear without masking.

Subject	Minimum Loss		Maximum Loss		Deviation
8	50°70%	24.28	20°80%	35.00	10.71 db
9	50°70%	25.00	90°80%	38.57	13.57
10	50°70%	46.42	90°65%	51.42	5.00
11	70°50%(2)	22.14	(90°80% (90°65%	30.71	8.57
12	70°50%(2)	50.71	20°80%	65.71	15.00
13	50°70%	20.71	(70°50%(1) (70°50%(2) (70°65%	25.71	5.00
14	50°70%	52.85	20°80%	78.57	25.71

Five of the seven audiometric measurements were best at 50°70% with deviations or differences between tests ranging from 5.00 to 25.71 decibels. Average minimum loss: 12.00 decibels.

Two of the seven audiometric measurements were best at 70°50%(2) with deviations of 8.57 and 15.00 decibels. Average minimum loss: 11.79 decibels.

Three of the seven audiometric measurements were poorest at 20°80% with deviations ranging from 10.71 to 25.71 decibels. Average maximum loss: 17.14 decibels.

One of the seven audiometric measurements was poorest at 90°80% with a deviation of 13.57. Maximum loss: 13.57 decibels.

One of the seven audiometric measurements was poorest at 90°65% with a deviation of 5.00 decibels. Maximum loss: 5.00 decibels.

One of the seven audiometric measurements was poorest at both 90°80% and 90°65% with a deviation of 8.57 decibels. Maximum loss: 8.57 decibels.

One of the seven audiometric measurements was poorest at 70°50%(1), 70°50%(2) and at 70°65% with a deviation of 5.00 decibels. Maximum loss: 5.00 decibels.

Best Score (Minimum Loss)

No. of Subjects	Test	Deviation
5	50°70%	12.00 db
2	70°50%(2)	11.79

Poorest Score (Maximum Loss)

3	20°80%	17.14
1	90°80%	13.57
1	90°65%	5.00
1	(90°65% (90°80%	8.57
1	(70°50%(1) (70°50%(2) (70°65%	5.00

Five of the seven audiograms had deviations greater than the 5 decibels normally expected

Subject 13	5.00 db
Subject 10	5.00
Subject 11	8.57
Subject 8	10.71
Subject 9	13.57
Subject 12	15.00
Subject 14	25.71

Comparison of minimum and maximum hearing loss, bone conduction.

Subject	Minimum Loss		Maximum Loss		Deviation
8	50°70%	7.50	70°65%	15.00	7.50 db
9	70°65%	3.33	(20°80% (70°50%(1)	16.66	13.33
10	50°70%	3.33	90°80%	20.83	17.50
11	(70°50%(1) (70°50%(2)	4.16	90°80%	22.50	18.34
12	70°50%(1)	12.50	20°80%	50.83	38.33
13	(50°70% (70°50%(1) (70°50%(2)	4.16	70°65%	17.50	13.33
14	50°70%	15.83	90°80%	31.66	15.83

Three of the seven audiometric measurements were best at 50°70% with deviations ranging from 7.50 to 15.83 decibels. Average minimum loss: 13.61 decibels.

One of the seven audiometric measurements was best at 70°65% with a deviation of 13.33 decibels. Minimum loss: 13.33 decibels.

One of the seven audiometric measurements was best at both 70°50%(1) and 70°50%(2) with a deviation of 18.34 decibels. Minimum loss: 18.34 decibels.

One of the seven audiometric measurements was best at 70°50%(1) with a deviation of 38.33 decibels. Minimum loss: 38.33 decibels.

One of the seven audiometric measurements was best at 70°50%(1), 70°50%(2) and 70°65% with a deviation of 13.33 decibels. Minimum loss: 13.33 decibels.

Three of the seven audiometric measurements were poorest at 90°80% with deviations ranging from 15.83 to 18.34 decibels. Average maximum loss: 17.22 decibels.

Two of the seven audiometric measurements were poorest at 70°65% with deviations of 7.50 and 13.33. Average maximum loss: 10.42 decibels.

One of the seven audiometric measurements was poorest at 20°80% with a deviation of 38.33 decibels. Maximum loss: 38.33 decibels.

One of the seven audiometric measurements was poorest at both 20°80% and 70°50%(1) with a deviation of 13.33 decibels. Maximum loss: 13.33 decibels.

Best Score (Minimum Loss)

No. of Subjects	Test	Deviation
3	$50^{\circ}70\%$	13.61 db
1	$70^{\circ}65\%$	13.33
1	$70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$	18.34
1	$70^{\circ}50\%(1)$	38.33
1	$50^{\circ}70\%$ $70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$	13.33

Poorest Score (Maximum Loss)

3	$90^{\circ}80\%$	17.22
2	$70^{\circ}65\%$	10.42
1	$20^{\circ}80\%$	38.33
1	$20^{\circ}80\%$ $70^{\circ}50\%(1)$	13.33

All seven subjects had deviations, or differences between minimum and maximum losses, greater than the 5 decibels normally expected.

Subject 8	7.50 db
Subject 9	13.33
Subject 13	13.33
Subject 14	15.83
Subject 10	17.50
Subject 11	18.34
Subject 12	38.33

Comparison of minimum and maximum hearing loss, better ear (following page).

Subject	1st		7th		Deviation
8	$70^{\circ}50\%(2)$	5.71	$70^{\circ}65\%$	10.71	5.00 db
9	$70^{\circ}50\%(1)$	2.86	$90^{\circ}80\%$	18.57	15.71
10	$70^{\circ}50\%(2)$ and $70^{\circ}65\%$	-5.00	$90^{\circ}80\%$ and $20^{\circ}80\%$	.72	5.72
11	$70^{\circ}50\%(1)$, $70^{\circ}50\%(2)$ and $70^{\circ}65\%$	-7.14	$20^{\circ}80\%$	.72	7.86
12	$90^{\circ}80\%$	12.14	$20^{\circ}80\%$	22.86	10.71
13	$50^{\circ}70\%$ and $20^{\circ}80\%$	17.14	$70^{\circ}65\%$	21.42	4.28
14	$50^{\circ}70\%$	-3.57	$20^{\circ}80\%$	7.86	11.42

One of the seven audiometric measurements was best at $70^{\circ}50\%(2)$ with a deviation of 5.00 decibels. Minimum loss: 5.00 decibels.

One of the seven audiometric measurements was best at $70^{\circ}50\%(1)$ with a deviation of 15.71 decibels. Minimum loss: 15.71 decibels.

One of the seven audiometric measurements was best at both $70^{\circ}50\%(1)$ and $70^{\circ}65\%$ with a deviation of 5.72 decibels. Minimum loss: 5.72 decibels.

One of the seven audiometric measurements was best at $70^{\circ}50\%(1)$, $70^{\circ}50\%(2)$ and $70^{\circ}65\%$ with a deviation of 7.86 decibels. Minimum loss: 7.86 decibels.

One of the seven audiometric measurements was best at $90^{\circ}80\%$ with a deviation of 10.71 decibels. Minimum loss: 10.71 decibels.

One of the seven audiometric measurements was best at 50°70% with a deviation of 11.42 decibels. Minimum loss: 11.42 decibels.

One of the seven audiometric measurements was best at both 50°70% and 20°80% with a deviation of 4.28 decibels.

Three of the seven audiometric measurements were poorest at 20°80% with deviations ranging from 7.86 to 11.42 decibels. Average maximum loss: 10.00 decibels.

Two of the seven audiometric measurements were poorest at 70°65% with deviations of 4.28 and 5.00 decibels. Average maximum loss: 4.64 decibels.

One of the seven audiometric measurements was poorest at 90°80% with a deviation of 15.71 decibels. Maximum loss: 15.71 decibels.

One of the seven audiometric measurements was poorest at both 90°80% and 20°80% with a deviation of 5.72 decibels. Maximum loss: 5.72 decibels.

Best Score (Minimum Loss)

No. of Subjects	Test	Deviation
1	$70^{\circ}50\%(2)$	5.00 db
1	$70^{\circ}50\%(1)$	15.71
1	$70^{\circ}50\%(1)$ $70^{\circ}65\%$	5 72
1	$70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$ $70^{\circ}65\%$	7.86
1	$90^{\circ}80\%$	10.71
1	$50^{\circ}70\%$	11.42
1	$50^{\circ}70\%$ $20^{\circ}80\%$	4.28

Poorest Score (Maximum Loss)

3	$20^{\circ}80\%$	10.00 (9.99)
2	$70^{\circ}65\%$	4.64
1	$90^{\circ}80\%$	15.71
1	$90^{\circ}80\%$ $20^{\circ}80\%$	5.72

Five of the seven subjects had deviations or differences between minimum and maximum losses greater than the 5 decibels normally expected.

Subject 13	4.28 db
Subject 8	5.00
Subject 10	5.71
Subject 11	7.85
Subject 12	10.71
Subject 14	11.42
Subject 9	15.71

Summary of comparison of minimum and maximum hearing loss, hard-of-hearing group, both ears.

Fourteen of the twenty-eight audiometric measurements (counting poorer ear with and without masking, bone conduction

and better ear individually) were best, that is, the hearing loss was least, at 50°70% with deviations or differences between minimum and maximum loss ranging from 5.00 to 25.71 decibels, an average minimum loss of 12.71 decibels.

Three of the twenty-eight audiometric measurements were best at 70°50%(1) with deviations ranging from 8.57 to 15.00 decibels, an average minimum loss of 9.52 decibels.

Two of the twenty-eight audiometric measurements were best at 70°65% with deviations ranging from 5.72 to 13.33 decibels, an average minimum loss of 13.10 decibels.

Two of the twenty-eight audiometric measurements were best at 90°80% with deviations ranging from 10.71 to 13.57, an average minimum loss of 14.78 decibels.

Two of the twenty-eight audiometric measurements were best at 70°50%(1) with deviations ranging from 15.71 to 38.33, an average minimum loss of 27.02 decibels.

The remaining five audiometric measurements were best in the following tests:

One at	70°50%(1) 70°50%(2) 70°65%	Minimum loss	7.86 db
One at	70°50%(1) 70°65%	Minimum loss	5.72 db
One at	70°50%(1) 70°50%(2)	Minimum loss	18.34 db
One at	70°50%(1) 70°50%(2) 50°70%	Minimum loss	13.33 db
One at	50°70% 20°80%	Minimum loss	4.28 db

Eight of the twenty-eight audiometric measurements were poorest, that is, the hearing loss was greatest, at $90^{\circ}80\%$ with deviations or differences between minimum and maximum loss ranging from 12.14 to 18.34 decibels. Average maximum loss: 15.76 decibels.

Nine of the twenty-eight audiometric measurements were poorest at $20^{\circ}80\%$ with deviations ranging from 10.71 to 25.71 decibels, an average maximum loss of 17.35 decibels.

Four of the twenty-eight audiometric measurements were poorest at $70^{\circ}65\%$ with deviations ranging from 7.50 to 13.33 decibels, an average maximum loss of 7.53 decibels.

Two of the twenty-eight audiometric measurements were poorest at both $90^{\circ}80\%$ and $20^{\circ}80\%$ with deviations ranging from 5.72 to 10.00 decibels, an average maximum loss of 7.86 decibels.

Two of the twenty-eight audiometric measurements were poorest at $70^{\circ}50\%(1)$, $70^{\circ}50\%(2)$ and $70^{\circ}65\%$ with deviations of 5.00 decibels.Each. Maximum deviation: 5.00 decibels.

The remaining three audiometric measurements were poorest at the following tests:

One at	$90^{\circ}65\%$	Maximum loss	5.00 db
One at	$(90^{\circ}65\%$	Maximum loss	8.57 db
One at	$(20^{\circ}80\%$ $(70^{\circ}50\%(1)$	Maximum loss	13.33 db

Twenty-three of the twenty-eight audiometric measurements had deviations or differences between the minimum and maximum scores greater than the 5 decibels normally expected on successive tests.

9. Comparison of first and second rank scores, poorer ear with masking.

A comparison of the minimum and maximum loss of the hard-of-hearing group indicated that fourteen of the twenty-eight audiometric measurements were best, that is, the hearing loss was least, at 50°70%, the mental optimum. The purpose of the following comparison is to determine whether the second best performance occurred at the physical optimum of 70°50% and a humidity range from 50% to 65%.

Subject	1st		2nd		Deviation
8	50°70%	29.14	(70°50%(1) (70°50%(2) (90°65%	37.14	10.00 db
9	50°70%	32.86	(90°65% (70°50%(2)	35.71	2.86
10	70°65%	47.14	20°80%	48.57	1.43
11	50°70%	25.00	70°50%(2)	25.71	.71
12	90°80%	57.86	(70°50%(1) (70°50%(2)	58.57	.71
13	50°70%	20.71	(20°80% (90°80%	24.28	3.57
14	50°70%	73.57	70°50%(2)	78.57	5.00

Five of the seven audiometric measurements were first at 50°70% with deviations ranging from .71 to 10.00 decibels, an average gain of 4.43 decibels over the second place score.

One of the seven audiometric measurements was first at 70°65% with a gain of only 1.43 decibels over the second place score.

One of the seven audiometric measurements was first at 90°80% with a gain of only .71 decibels over the second place score.

Two of the seven audiometric measurements were second at 70°50%(2) with deviations of .71 and 5.00 decibels, an average loss of 2.86 decibels from the first place scores.

The remaining five were second at the following tests:

One at	(70°50%(1) (70°50%(2) (90°65%	Loss of	2.86 db
One at	(90°65% (70°50%	Loss of	10.00 db
One at	20°80%	Loss of	2.86 db
One at	(70°50%(1) (70°50%(2)	Loss of	.71 db
One at	(90°80% (20°80%	Loss of	3.57 db

No of Subjects	Test	Deviation
	1st Place	
5	50°70%	4.43 db
1	70°65%	1.43
1	90°80%	.71
	2nd Place	
2	70°50%(2)	2.86
1	(70°50%(1) (70°50%(2) (90°65%	2.86
1	(90°65% (70°50%(2)	10.00
1	20°80%	2.86
1	(70°50%(1) (70°50%(2)	.71
1	(90°80% (20°80%	3.57

Only one of the seven audiometric measurements had a deviation greater than the 5 decibels normally expected on successive tests.

Subject 11	.71 db
Subject 12	.71
Subject 10	1.43
Subject 9	2.86
Subject 13	3.57
Subject 14	5.00
Subject 8	10.00

Four of the seven subjects scored second at 70° and a humidity range of 50% to 65%, the physical optimum.

One scored second at both 70°50% and 90°65%.

Two of the seven subjects scored second at tests other than the physical optimum.

Comparison of first and second rank scores, poorer ear without masking.

Subject	1st		2nd		Deviation
8	50°70%	24.28	70°50%(1)	30.00	5.71 db
9	50°70%	25.00	70°50%(2)	30.00	5.00
10	50°70%	46.42	(70°65% (20°80%	47.14	.72
11	70°50%(2)	22.14	50°70%	23.57	1.43
12	70°50%(2)	50.71	50°70%	54.28	3.56
13	50°70%	20.71	(20°80% (90°80%	24.28	3.56
14	50°70%	52.85	(70°50%(1) (70°50%(2)	60.71	7.86

Five of the seven audiometric measurements were first at 50°70% with deviations ranging from .72 to 7.86 decibels, an average gain of 4.57 decibels over second place scores.

Two of the seven audiometric measurements were first at 70°50%(2) with deviations of 1.43 and 3.56 decibels, an average gain of only 2.50 decibels over second place scores.

Two of the seven audiometric measurements were second at 50°70% with deviations of 1.43 and 3.56 decibels, an average loss of only 2.50 decibels from first place scores.

The remaining five audiometric measurements were second at the following tests:

One at	$70^{\circ}50\%(1)$	Loss of	5.71 db
One at	$70^{\circ}50\%(2)$	Loss of	5.00 db
One at	$\begin{pmatrix}70^{\circ}65\% \\ 20^{\circ}80\%\end{pmatrix}$	Loss of	.72 db
One at	$\begin{pmatrix}20^{\circ}80\% \\ 90^{\circ}80\%\end{pmatrix}$	Loss of	3.57 db
One at	$\begin{pmatrix}70^{\circ}50\%(1) \\ 70^{\circ}50\%(2)\end{pmatrix}$	Loss of	7 86 db

1st Place

No. of Subjects	Test	Deviation
5	$50^{\circ}70\%$	4.57 db
2	$70^{\circ}50\%(2)$	1.43

2nd Place

2	$50^{\circ}70\%$	1.43
1	$70^{\circ}50\%(1)$	5.71
1	$70^{\circ}50\%(2)$	5.00
1	$\begin{pmatrix}70^{\circ}65\% \\ 20^{\circ}80\%\end{pmatrix}$	.72
1	$\begin{pmatrix}20^{\circ}80\% \\ 90^{\circ}80\%\end{pmatrix}$	3.57
1	$\begin{pmatrix}70^{\circ}50\%(1) \\ 70^{\circ}50\%(2)\end{pmatrix}$	7.86

Two of the seven subjects had deviations or differences between the first and second place scores greater than the 5.00 decibels normally expected.

Subject 10	.72 db
Subject 11	1.43
Subject 12	3.56
Subject 13	3.56
Subject 9	5.00
Subject 8	5.71
Subject 14	7.86

Four of the seven subjects scored second at the physical optimum of 70° and a humidity range of 50% to 65%.

One scored second at both $70^{\circ}65\%$ and $20^{\circ}80\%$.

Two scored second at $50^{\circ}70\%$, the mental optimum.

Comparison of first and second rank scores, bone conduction.

Subject	1st		2nd		Deviation
8	$50^{\circ}70\%$	7.50	$70^{\circ}50\%(2)$	9.16	1.66 db
9	$70^{\circ}65\%$	3.33	$50^{\circ}70\%$	6.66	3.33
10	$50^{\circ}70\%$	3.33	$70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$	5.83	2.50
11	$70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$	4.16	$70^{\circ}65\%$ $50^{\circ}70\%$	5.83	.72
12	$70^{\circ}50\%(1)$	12.50	$70^{\circ}50\%(2)$	15.83	3.33
13	$50^{\circ}70\%$ $70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$	4.16	$90^{\circ}80\%$	7.50	3.33
14	$50^{\circ}70\%$	15.83	$70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$	18.33	2.50

Three of the seven audiometric measurements were better, that is, the hearing loss was less, at $50^{\circ}70\%$ with deviations, or differences, between tests ranging from 1.66 to 2.50

decibels, an average gain of only 2.22 decibels over second place score.

The remaining four of the seven audiometric measurements were best at the following tests:

One at	(70°50%(1) (70°50%(2)	Gain of	.72 db
One at	70°50%(1)	Gain of	3.33 db
One at	70°65%	Gain of	3.33 db
One at	(50°70% (70°50%(1) (70°50%(2)	Gain of	2.50 db

Two of the seven audiometric measurements were second at 70°50%(2) with deviations of 1.66 and 3.33, an average loss of only 2.50 decibels from first place score.

Two of the seven audiometric measurements were second at 70°50%(1) and 70°50%(2) with deviations of 2.50 decibels each, an average loss of only 2.50 decibels from the first place score.

The remaining three of the seven audiometric measurements placed second at the following tests:

One at	50°70%	Loss of	3.33 db
One at	(50°70% (70°65%	Loss of	.72 db
One at	90°80%	Loss of	3.33 db

No. of Subjects	Test	Deviation
	1st Place	
3	50°70%	2.22 db
1	(70°50%(1) (70°50%(2)	3.33
1	70°65%	3.33
1	(50°70% (70°50%(1) (70°50%(2)	2.50
1	70°50%(1)	3.33
	2nd Place	
2	70°50%(2)	2.50
2	(70°50%(1) (70°50%(2)	2.50
1	50°70%	3.33
1	(50°70% (70°65%	.72
1	90°80%	3.33

All seven of the subjects had deviations or differences between first and second place scores of less than the 5 decibels normally expected on successive tests

Subject 11	.72 db
Subject 8	1.66
Subject 10	2.50
Subject 14	2.50
Subject 9	3.33
Subject 12	3.33
Subject 13	3.33

Four of the seven subjects scored second at the physical optimum of 70° and a humidity range of 50% to 65%.

One scored second at 50°70%, the mental optimum.

One scored second at both the mental and the physical optima.

One of the subjects scored second in a test other than the physical or mental optimum.

Comparison of first and second rank scores, better ear.

Subject	1st		2nd		Deviation
8	$70^{\circ}50\%(2)$	5.71	$50^{\circ}70\%$	6.42	.71 db
9	$70^{\circ}50\%(1)$	2.86	$90^{\circ}65\%$	5.00	2.14
10	$70^{\circ}50\%(1)$ $70^{\circ}65\%$	-5.00	$70^{\circ}50\%(1)$	-4.28	.72
11	$70^{\circ}50\%(1)$ $70^{\circ}50\%(2)$ $70^{\circ}65\%$	-7.14	$50^{\circ}70\%$	-5.71	1.43
12	$90^{\circ}80\%$	12.14	$70^{\circ}50\%(2)$	13.57	1.43
13	$50^{\circ}70\%$ $20^{\circ}80\%$	17.14	$90^{\circ}65\%$	17.85	.71
14	$50^{\circ}70\%$	-3.57	$70^{\circ}50\%(2)$ $70^{\circ}65\%$	.00	3.57

One of the seven audiometric measurements was first at $70^{\circ}50\%(2)$ with a gain of only .71 decibels over the second place score.

One of the seven audiometric measurements was first at both $70^{\circ}50\%(1)$ and $70^{\circ}65\%$ with a gain of only .72 decibels over the second place score.

One of the seven audiometric measurements was first at both $50^{\circ}70\%$ and $20^{\circ}80\%$ with a gain of only .71 decibels over the second place score.

One of the seven audiometric measurements was first at $70^{o}50\%(1)$, $70^{o}50\%(2)$, and $70^{o}65\%$ with a gain of only 1.43 decibels over the second place score.

One of the seven audiometric measurements was first at $90^{o}80\%$ with a gain of only 1.43 decibels over the second place score.

One of the seven audiometric measurements was first at $70^{o}50\%(1)$ with a gain of only 2.14 decibels over the second place score.

One of the seven audiometric measurements was first at $50^{o}70\%$ with a gain of 3.57 decibels over the second place score.

Two of the seven audiometric measurements were second at $50^{o}70\%$ with deviations or differences between first and second place scores of .71 and 1.43 decibels, an average loss of only 1.07 decibels.

Two of the seven audiometric measurements were second at $90^{o}65\%$ with deviations of .71 and 2.14 decibels, an average loss of only 1.43 decibels.

One was second at $70^{o}50\%(1)$ with a loss of .71 decibels.

One was second at $70^{o}50\%(2)$ with a loss of 1.43 decibels.

One was second at $70^{o}50\%(2)$ and $70^{o}65\%$ with a loss of 3.57 decibels.

1st Place

No. of Subjects	Test	Deviation
1	70°50%(2)	.71 db
1	(70°50%(1) (70°65%	.72
1	(50°70% (20°80%	.71
1	(70°50%(1) (70°50%(2) (70°65%	1.43
1	90°80%	1.43
1	70°50%(1)	2.14
1	50°70%	3.57

2nd Place

2	50°70%	1.07
2	90°65%	.71
1	70°50%(1)	.71
1	70°50%(2)	1.43
1	(70°50%(2) (70°65%	3.57

All seven subjects had deviations or differences between the first and second place tests of less than the 5 decibels normally expected on successive tests.

Subject 8	.71 db
Subject 13	.71
Subject 10	.72
Subject 11	1.43
Subject 12	1.43
Subject 9	2.14
Subject 14	3.57

Three of the seven subjects scored second in the physical optimum, and a humidity range from 50% to 60%.

Two of the seven subjects scored second in the mental optimum of 50°70%.

Two of the seven subjects scored second in tests other than the physical optimum or the mental optimum.

Summary of first and second rank scores

	1st	
No. of Measurements	Test	Deviation
14	50°70%	3.87 db
7	70°50%	2.17
2	70°65%	2.38
2	70°50% 70°65%	1.08
1	70°50% 50°70%	2.50
1	50°70% 20°80%	.71
1	90°80%	1.43
	2nd	
12	70°50%	3.09
5	50°70%	2.09
3	70°50% 90°65%	5.47
2	90°65%	1.43
2	90°80% 20°80%	3.57
1	20°80%	2.86
1	70°65% 20°80%	.72
1	50°70% 70°65%	.72
1	90°80%	3.33

Fourteen of the twenty-eight audiometric measurements (counting poorer ear with and without masking, bone conduction, and better ear individually) were best in the mental optimum of 50°70% with an average gain of only 3.87 decibels over the second place scores. One measurement was best at both 50°70% and 20°80%. Five were second in the mental optimum and one was second at both 50°70% and 70°65%.

Twelve of the twenty-eight measurements were second in the physical optimum of 70°50%. One was second at both 70°50% and 90°65%. Eleven were first in the physical optimum of 70°50% and 70°65%.

Twenty-one of the twenty-eight measurements were either first or second in the two climatic optima, although one measurement was best at both 50°70% and 20°80%, and another was second at both 70°65% and 20°80%.

Only three of the twenty-eight measurements had deviations or differences between first and second rank scores greater than the 5 decibels normally expected on successive tests.

10. Comparison of the test scores at 90°80% and 20°80%.

The purpose of the following comparison is to determine the hearing acuity of the hard-of-hearing subjects in conditions of constant humidity, but different temperatures.

	Poorer Ear with Masking		
Subject	90°80%	20°80%	Deviation
8	47.14	42.15	5.00 db
9	38.57	51.42	2.85
10	60.00	48.57	11.43
11	37.14	32.86	4.28
12	57.86	75.71	7.85
13	24.28	24.28	.00
14	83.57	83.57	.00

Two of the seven audiometric measurements were better at 90°80% with deviations of 2.85 and 7.85 decibels, an average gain of 5.35 decibels over 20°80%.

Three of the seven audiometric measurements were better at 20°80% with deviations ranging from 4.28 to 11.43 decibels, an average gain of 6.90 decibels over 90°80%.

Two of the seven audiometric measurements had the same loss at both 90°80% and 20°80%.

No. of Subjects	Better Score	Deviation
2	90°80%	5.35 db
3	20°80%	6.90
2	No Change	

Two of the seven audiometric measurements had deviations greater than the 5 decibels normally expected.

Subject 13	.00 db
Subject 14	.00
Subject 9	2.85
Subject 11	4.28
Subject 8	5.00
Subject 12	7.85
Subject 10	11.43

Poorer Ear without Masking

Subject	90°80%	20°80%	Deviation
8	34.28	35.00	.72 db
9	38.57	36.42	2.13
10	50.71	47.14	3.57
11	30.71	27.85	2.86
12	57.14	65.71	8.57
13	24.28	24.28	.00
14	70.00	78.57	8.57

Three of the seven audiometric measurements were better at 90°80% with deviations ranging from .72 to 8.57 decibels, an average gain of 5.57 decibels over 20°80%.

Three of the seven audiometric measurements were better at 20°80% with deviations ranging from 2.13 to 3.57 decibels, an average gain of 2.52 decibels over 90°80%.

One of the seven audiometric measurements was the same at both 90°80% and 20°80%.

No. of Subjects	Better Score	Deviation
3	90°80%	5.57 db
3	20°80%	2.52
1	No Change	

Two of the seven audiometric measurements had deviations greater than the 5 decibels normally expected.

Subject 13	.00 db
Subject 8	.72
Subject 9	2.13
Subject 11	2.86
Subject 10	3.57
Subject 12	8.57
Subject 14	8.57

Bone Conduction

Subject	90°80%	20°80%	Deviation
8	14.16	11.66	2.50 db
9	8.33	16.66	8.33
10	20.83	10.00	10.83
11	22.50	15.83	6.32
12	33.33	50.83	17.50
13	7.50	10.83	3.33
14	31.66	28.33	3.33

Three of the seven audiometric measurements were better at 90°80% with deviations ranging from 3.33 to 17.50 decibels, an average gain of 9.72 decibels over 20°80%

Four of the seven audiometric measurements were better at 20°80% with deviations ranging from 2.50 to 10.83 decibels, an average gain of 5.75 decibels over 90°80%.

No. of Subjects	Better Score	Deviation
3	$90^{\circ}80\%$	9.72 db
4	$20^{\circ}80\%$	5.75

Four of the seven subjects had deviations greater than the 5 decibels normally expected.

Subject 8	2.50 db
Subject 13	3.33
Subject 14	3.33
Subject 11	6.32
Subject 9	8.33
Subject 10	10.83
Subject 12	17.50

	Better Ear		
Subject	$90^{\circ}80\%$	$20^{\circ}80\%$	Deviation
8	8.57	9.28	.71 db
9	18.57	10.71	7.86
10	.72	.72	.00
11	-5.00	.72	5.72
12	12.14	22.86	10.74
13	20.00	17.14	2.86
14	2.86	7.86	5.00

Four of the seven audiometric measurements were better at $90^{\circ}80\%$ with deviations ranging from .71 to 10.74 decibels, an average gain of 5.44 decibels over $20^{\circ}80\%$.

Two of the seven audiometric measurements were better at $20^{\circ}80\%$ with deviations of 2.86 and 7.86 decibels, an

average gain of 5.12 decibels over 90°80%.

One of the seven audiometric measurements was the same at both 90°80% and 20°80%.

No. of Subjects	Better Test	Deviation
4	90°80%	5.44 db
3	20°80%	5.12
1	No Change	

Three of the seven subjects had deviations greater than the 5 decibels normally expected on successive tests.

Subject 10	.00 db
Subject 8	.71
Subject 13	2.86
Subject 14	5.00
Subject 11	5.72
Subject 9	7.86
Subject 12	10.74

Summary of comparison of test scores of 90°80% and 20°80%.

Twelve of the twenty-eight audiometric measurements were better at 90°80% with deviations ranging from .72 to 17.50 decibels, an average gain of 5.82 decibels over 20°80%.

Twelve of the twenty-eight audiometric measurements were better at 20°80% with deviations ranging from 2.13 to 11.43 decibels, an average gain of 5.25 decibels over 20°80%.

Four of the twenty-eight audiometric measurements were the same at 90°80% and 20°80%.

No. of Measurements	Better Score	Deviation
12	90°80%	5.82 db
12	20°80%	5.25
4	No Change	

11. Comparison of test scores at 90°65% and 90°80%.

The purpose of the following comparison is to determine the hearing acuity of the seven hard-of-hearing subjects in combinations in which the temperature was constant, but the humidity different.

Poorer Ear with Masking

Subject	90°65%	90°80%	Deviation
8	37.14	47.14	10.00 db
9	35.71	38.57	2.86
10	55.00	60.00	5.00
11	36.42	37.14	.72
12	63.57	57.86	5.71
13	25.00	24.28	.72
14	82.14	83.57	1.43

Six of the seven audiometric measurements were better at 90°65%, that is, the hearing loss was less, with deviations ranging from .72 to 10.00 db, an average gain of 3.62 decibels over 90°80%.

One of the seven audiometric measurements was better at 90°80% by a gain of 5.71 decibels over 90°65%.

No. of Subjects	Better Score	Deviation
6	90°65%	3.63
1	90°80%	5.71

Two of the seven subjects had deviations or differences between tests greater than the 5 db normally expected.

Subject 13	.72 db
Subject 11	.72
Subject 14	1.43
Subject 9	2.86
Subject 10	5.00
Subject 12	5.71
Subject 8	10.00

Poorer Ear without Masking

Subject	90°65%	90°80%	Deviation
8	32.86	34.28	1.42 db
9	35.71	38.57	2.86
10	51.42	50.71	.72
11	30.71	30.71	.00
12	60.00	57.14	2.86
13	25.00	24.28	.72
14	66.42	70.00	3.58

Three of the seven audiometric measurements were better at 90°65% with deviations ranging from 1.42 to 3.58, an average gain of 2.92 decibels over 90°80%.

Three of the seven audiometric measurements were better at 90°80% with deviations ranging from .72 to 2.86

decibels, an average gain of 1.42 decibels over $90^{o}65\%$.

One of the seven audiometric measurements was the same at both $90^{o}65\%$ and $90^{o}80\%$.

No. of Subjects	Better Score	Deviation
3	$90^{o}65\%$	2.92 db
3	$90^{o}80\%$	1.42
1	No Change	

All seven subjects had deviations or differences between tests less than the 5 decibels normally expected on successive tests.

	db
Subject 11	.00
Subject 10	.72
Subject 13	.72
Subject 8	1.42
Subject 9	2.86
Subject 12	2.86
Subject 14	3.58

Bone Conduction

Subject	$90^{o}65\%$	$90^{o}80\%$	Deviation
8	12.50	14.16	1.66 db
9	8.33	8.33	.00
10	10.00	20.83	10.83
11	17.50	22.50	5.00
12	27.50	33.33	5.83
13	8.33	7.50	.83
14	27.50	31.66	4.16

Five of the seven audiometric measurements were better at 90°65% with deviations ranging from 1.66 to 10.83 decibels, an average gain of 5.50 decibels over 90°80%.

One of the seven audiometric measurements was better at 90°80% with a gain of .83 decibels over 90°65%.

One of the seven audiometric measurements was the same at both 90°65% and 90°80%.

No. of Subjects	Better Score	Deviation
5	90°65%	5.50 db
1	90°80%	.83
1	No Change	

Two of the seven subjects had deviations or differences between the two tests greater than the 5 decibels normally expected.

Subject 9	.00 db
Subject 13	.83
Subject 8	1.66
Subject 14	4.16
Subject 11	5.00
Subject 12	5.83
Subject 10	10.83

	Better Ear		
Subject	90°65%	90°80%	Deviation
8	8.57	8.57	.00 db
9	5.00	18.57	13.57
10	-2.14	.72	2.86

Better Ear (Cont'd.)

Subject	90°65%	90°80%	Deviation
11	-5.00	-5.00	.00 db
12	15.71	12.14	3.57
13	17.85	20.00	2.15
14	5.00	2.86	1.14

Three of the seven audiometric measurements were better at 90°65% with deviations ranging from 2.15 to 13.57 decibels, an average gain of 6.19 decibels over 90°80%.

Two scored higher at 90°80% with deviations of 3.57 and 1.14 decibels, an average gain of 2.36 decibels over 90°65%.

Two scored the same at both 90°65% and 90°80%.

No. of Subjects	Better Score	Deviation
3	90°65%	6.19 db
2	90°80%	2.36
2	No Change	

One of the seven subjects had a deviation between tests greater than the 5 decibels normally expected.

Subject 8	.00 db
Subject 11	.00
Subject 14	1.14
Subject 13	2.15
Subject 10	2.86
Subject 12	3.57
Subject 9	13.57

Summary of test scores at $90^{o}65\%$ and $90^{o}80\%$.

Seventeen of the twenty-eight audiometric measurements were better at $90^{o}65\%$ with deviations ranging from .72 to 13.57 decibels, an average gain of 4.39 decibels over $90^{o}80\%$.

Seven were better at $90^{o}80\%$ with deviations ranging from .72 to 5.71 decibels, an average gain of 2.22 decibels over $90^{o}80\%$.

Four had no change in scores of the two tests.

No. of Measurements	Better Score	Deviation
17	$90^{o}65\%$	4.39 db
7	$90^{o}80\%$	2.22
4	No Change	

12. Comparison of test scores at $70^{o}50\%$(1) and $70^{o}50\%$(2).

The series of seven tests began and ended with the combination $70^{o}50\%$. This permitted checking the validity of the tests, and observing the influence of practice among the subjects.

Poorer Ear with Masking

Subject	70°50%(1)	70°50%(2)	Deviation
8	37.14	37.14	.00 db
9	42.86	35.71	7.15
10	53.57	50.71	2.86
11	32.86	25.71	7.15
12	58.57	58.57	.00
13	25.71	25.71	.00
14	78.57	80.00	1.43

Three of the seven audiometric measurements were better at 70°50%(2) with deviations or differences between the tests ranging from 2.86 to 7.15, an average gain of 5.72 decibels over 70°50%(1).

One of the seven audiometric measurements was better at 70°50%(1), with a gain of 1.43 decibels over 70°50%(2).

Three scored the same on both tests.

No. of Subjects	Better Score	Deviation
3	70°50%(2)	5.72 db
1	70°50%(1)	1.43
3	No Change	

Two of the seven subjects had deviations greater than the 5 decibels normally expected on successive tests.

Subject 8	.00 db
Subject 12	.00
Subject 13	.00
Subject 14	1.43
Subject 10	2.86
Subject 9	7.15
Subject 11	7.15

Poorer Ear without Masking

Subject	70°50%(1)	70°50%(2)	Deviation
8	30.00	31.42	1.42 db
9	36.42	30.00	6.42
10	48.57	48.57	.00
11	25.00	22.14	2.86
12	55.71	50.71	5.00
13	25.71	25.71	.00
14	60.71	60.71	.00

Three of the seven audiometric measurements were better at 70°50%(2) with deviations ranging from 2.86 to 6.42, an average gain of 4.76 decibels over 70°50%(1).

One scored better at 70°50%(1) with a gain of 1.42 decibels over 70°50%(2).

Three scored the same on both tests.

No. of Subjects	Better Score	Deviation
3	70°50%(2)	4.76 db
1	70°50%(1)	1.42
3	No Change	

One of the seven subjects had a deviation between tests greater than the 5 decibels normally expected.

Subject 10	.00 db
Subject 13	.00
Subject 14	.00
Subject 8	1.42
Subject 11	2.86
Subject 12	5.00
Subject 9	6.42

Bone Conduction

Subject	$70^{o}50\%(1)$	$70^{o}50\%(2)$	Deviation
8	10.00	9.16	.84 db
9	16.66	12.50	4.16
10	5.83	5.83	.00
11	4.16	4.16	.00
12	12.50	15.83	3.33
13	4.16	4.16	.00
14	18.33	18.33	.00

Two of the seven audiometric measurements were better at $70^{o}50\%(2)$ with deviations of .84 and 4.16 decibels, an average gain of 2.50 decibels over $70^{o}50\%(2)$.

One was better at $70^{o}50\%(1)$ with a gain of 3.33 decibels over $70^{o}50\%(2)$.

Four scored the same on both tests.

No. of Subjects	Better Score	Deviation
2	$70^{\circ}50\%(2)$	2.50 db
1	$70^{\circ}50\%(1)$	3.33
4	No Change	

All seven subjects had deviations or differences between tests less than the 5 decibels normally expected.

Subject 10	.00 db
Subject 11	.00
Subject 13	.00
Subject 14	.00
Subject 8	.84
Subject 12	3.33
Subject 9	4.16

	Better Ear		
Subject	$70^{\circ}50\%(1)$	$70^{\circ}50\%(2)$	Deviation
8	9.28	5.71	5.00 db
9	2.86	7.86	5.00
10	4.28	5.00	.72
11	-7.14	-7.14	.00
12	15.71	13.57	2.14
13	20.71	20.71	.00
14	.72	.00	.72

Three of the seven audiometric measurements were better at $70^{\circ}50\%(2)$ with deviations ranging from .72 to 5.00 decibels, an average gain of 2.62 decibels over $70^{\circ}50\%(1)$.

Two were better at $70^{\circ}50\%(1)$ with deviations of .72 and 5.00 decibels, an average gain of 2.86 decibels over $70^{\circ}50\%(2)$.

Two of the seven audiometric measurements were the same at both tests.

No. of Subjects	Better Score	Deviation
3	$70^{o}50\%(2)$	2.62 db
2	$70^{o}50\%(1)$	2.86
2	No Change	

All seven subjects had deviations, or differences between tests, within the normal limits of 5 decibels deviation between successive tests.

Subject 11	.00 db
Subject 13	.00
Subject 14	.72
Subject 10	.72
Subject 12	2.14
Subject 8	5.00
Subject 9	5.00

SUMMARY

Eleven of the twenty-eight audiometric measurements were better at $70^{o}50\%(2)$ with deviations or differences between tests ranging from .72 to 7.15 decibels, an average gain of 4.02 decibels over $70^{o}50\%(1)$, well below the limits of significance.

Five of the twenty-eight audiometric measurements were better at $70^{o}50\%(1)$ with deviations ranging from .72 to 5.00 decibels, an average gain of 2.38 decibels over $70^{o}50\%(2)$, still below the significant limit.

Twelve of the twenty-eight audiometric measurements were the same at both $70^{o}50\%(1)$ and $70^{o}50\%(2)$.

No. of Measurements	Better Score	Deviation
11	$70^{o}50\%(2)$	4.02 db
5	$70^{o}50\%(1)$	2.38
12	No Change	

Only three of the twenty-eight audiometric measurements had deviations between tests greater than the 5 decibels normally expected.

13. Maximum losses at 500, 1000 and 2000 cps.

According to Harris,[53] the chances are two out of three that the losses at 512, 1024 and 2048 should not vary more than 4 to 5 decibels on a repeated series of tests. The purpose of this analysis is to determine the maximum losses at the three frequencies on a series of tests at different temperature and humidity combinations and to compare the losses to the deviations or differences between scores in identical combinations.

Normal Group

	Right Ear			Left Ear		
Subject	500	1000	2000	500	1000	2000
1	10	5	10	5	10	5
2	15	5	10	10	10	5
3	10	5	10	5	5	10
4	10	5	5	10	10	0
5	5	5	5	15	10	25
6	10	10	10	10	5	10
7	10	20	10	20	30	15

	500	1000	2000
No. of measurements with deviations greater than the 5 db normally expected	11	7	6
No. of measurements with deviations less than 5 db	3	7	6

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[53] See p. 2.

Hard-of-Hearing Group

Subject	Poorer Ear with Masking			Poorer Ear without Masking		
	500	1000	2000	500	1000	2000
8	20	20	25	20	20	10
9	20	20	20	10	15	15
10	10	25	15	10	20	10
11	20	25	15	10	25	10
12	25	20	20	10	15	10
13	10	20	10	10	15	10
14	10	10	5	25	30	35

	Bone Conduction			Better Ear		
8	10	15	10	10	15	10
9	15	25	35	15	20	10
10	25	20	15	10	5	5
11	15	10	20	10	5	5
12.	40	45	30	15	5	10
13	15	10	10	10	5	20
14	25	20	25	15	15	15

	500	1000	2000
No. of measurements with deviations or differences greater than 5 db	28	24	26
No. of measurements with deviations less than 5 db	0	4	2

Summary of maximum losses, both groups:

No. of measurements with deviations between maximum and minimum loss greater than 5 db	39	31	34
No. of measurements with deviations less than 5 db	3	11	8

Deviations at 500, 1000 and 2000 between tests at 70°50%(1) and 70°50%(2).

	Normal Group					
	Right Ear			Left Ear		
Subject	500	1000	2000	500	1000	2000
1	0	5	0	5	0	0
2	5	5	10	0	5	0
3	5	0	5	5	5	10
4	5	0	0	0	5	0
5	0	0	0	5	0	0
6	0	0	10	5	0	5
7	0	0	0	0	0	0

	500	1000	2000
No. of measurements with deviations greater than 5 db	0	0	3
No. of measurements with deviations less than 5 db	14	14	11

	Hard-of-Hearing Group					
	Poorer Ear with Masking			Poorer Ear without Masking		
Subject	500	1000	2000	500	1000	2000
8	0	0	0	0	0	5
9	15	5	5	5	5	0
10	0	5	0	0	0	0
11	10	10	5	5	0	0
12	0	0	0	10	10	5
13	0	0	0	0	0	0
14	0	0	5	0	0	5

Hard-of-Hearing Group

Subject	Bone Conduction 500	1000	2000	Better Ear 500	1000	2000
8	5	5	10	5	10	10
9	10	10	15	0	15	5
10	0	0	0	0	5	0
11	0	0	0	0	0	0
12	0	5	0	0	5	5
13	0	0	0	0	0	0
14	0	0	0	0	0	0

	500	1000	2000
No. of measurements with deviations greater than 5 db	4	5	3
No. of measurements with deviations less than 5 db	24	23	25

Summary, both groups:

No. of measurements with deviations greater than 5 db	4	5	6
No. of measurements with deviations less than 5 db	38	37	36

Summary of losses at 500, 1000 and 2000 cps..

In varying temperature and humidity combinations, thirty-nine of the forty-two audiometric measurements at extreme limits of temperature and humidity showed deviations at 500 cps greater than the 5 db normally expected.

In identical temperature and humidity combinations, only four of the forty-two audiometric measurements showed deviations greater than 5 db at 500 cps. Four were greater at 1000 and six at 2000 cps.

14. Maximum deviations at high and low frequencies.

The purpose of this analysis is to determine the maximum losses at the high frequencies (4000 and 8000 cps) and at the low frequencies (125 and 250) on a series of tests at different temperature and humidity combinations and to compare the losses to the deviations between test scores in identical combinations of temperature and humidity.

Normal Group

Right Ear

Subject	125	250	4000	8000
1	10	5	10	10
2	10	10	15	20
3	5	5	15	15
4	10	5	10	20
5	35	20	10	10
6	15	5	10	20
7	20	15	10	15

Left Ear

1	15	5	10	10
2	15	10	10	20
3	15	10	5	15
4	15	10	15	10
5	15	10	5	15
6	5	10	10	15
7	20	15	20	10

	125	250	4000	8000
No. of measurements with deviations greater than 5 db, both ears	12	9	12	14
No. of measurements with deviations less than 5 db	2	5	2	0

Hard-of-Hearing Group

Subject	125	250	4000	8000
	Poorer Ear with Masking			
8	15	15	15	30
9	20	25	10	25
10	10	15	25	20
11	15	15	5	25
12	15	25	20	15
13	5	10	20	15
14	25	35	10	15
	Poorer Ear without Masking			
8	15	20	5	15
9	20	20	20	10
10	10	10	20	10
11	15	10	10	15
12	25	15	30	20
13	5	10	20	15
14	25	35	20	30
	Bone Conduction			
8	10	5	10	
9	15	25	25	
10	20	15	25	
11	25	25	20	
12	45	45	25	
13	15	10	25	
14	15	10	10	
	Better Ear			
8	10	10	10	15
9	25	20	10	25
10	15	5	15	10
11	15	15	10	20
12	5	20	20	15
13	25	10	10	25
14	15	10	10	10

	125	250	4000	8000
No. of measurements with deviations greater than 5 db	26	26	26	21
No. of measurements with deviations less than 5 db	2	2	2	0

Summary for both groups:

No. of measurements with deviations greater than 5 db	38	35	38	35
No. of measurements with deviations less than 5 db	4	7	4	0

Deviations at 70°50%(1) and 70°50%(2), High and Low Frequencies.

Normal Group

Subject	125	250	4000	8000
Right Ear				
1	5	5	0	5
2	0	5	0	10
3	0	5	5	5
4	0	5	0	0
5	0	5	0	0
6	5	0	5	0
7	5	10	0	0
Left Ear				
1	10	5	5	5
2	0	5	0	0
3	10	0	5	0
4	0	5	0	0
5	0	0	0	0
6	0	5	10	0
7	0	10	5	5

	125	250	4000	8000
No. of measurements with deviations greater than 5 db	2	2	1	1
No. of measurements with deviations less than 5 db	12	12	13	13

Hard-of-Hearing Group

Poorer Ear with Masking

Subject	125	500	4000	8000
8	0	0	0	0
9	5	5	5	10
10	0	0	10	5
11	0	10	0	15
12	0	0	0	0
13	0	0	0	0
14	0	5	0	10

Poorer Ear without Masking

8	0	0	5	0
9	10	5	15	5
10	0	0	0	0
11	0	10	0	15
12	5	5	0	0
13	0	0	0	0
14	0	5	0	0

Bone Conduction

8	0	0	5
9	10	5	25
10	0	0	0
11	0	0	0
12	5	5	5
13	10	0	0
14	0	0	0

	Better Ear			
Subject	125	500	4000	8000
8	0	0	10	0
9	10	5	0	0
10	0	0	0	0
11	5	5	0	0
12	5	0	0	0
13	0	0	0	0
14	5	0	5	5

	125	250	4000	8000
No. of measurements with deviations greater than 5 db	3	2	4	4
No. of measurements with deviations less than 5 db	25	26	24	17

Summary for both groups:

No. of measurements with deviations greater than 5 db	5	4	5	4
No. of measurements with deviations less than 5 db	37	38	37	30

Summary of losses at 125, 250, 4000 and 8000 cps.

In varying temperature and humidity combinations, twenty-six of the forty-two audiometric measurements at extreme limits of temperature and humidity showed deviations at 125 greater than the 5 db normally expected. Thirty-one showed deviations greater than 5 db at 250, twenty-six at 4000 and twenty-one at 8000 cps.

In identical temperature and humidity combinations, only five of the forty-two audiometric measurements showed deviations greater than 5 db at 125 cps. Four were greater than 5 db at 250, five at 4000 and four at 8000 cps.

15. This summary tabulation shows the maximum deviations or differences between maximum and minimum losses in extreme limits of temperature and humidity change for all fourteen subjects. Thirty-three of the forty-two audiometric measurements show deviations greater than the 5 decibels normally expected.

Normal Group		Hard-of-Hearing Group			
R	L	M	W	BC	B
3.57					
					4.28
5.00	5.00	5.00	5.00		5.00
	5.00		5.00		
	5.71				5.71
6.42	6.42				
7.41	7.41				
				7.50	
7.86	7.86				7.86
8.57			8.57		
		10.00			
			10.71		10.71
					11.42
		12.14			
		12.86			
				13.33	
				13.33	
			13.57		
14.28					
			15.00		
					15.71
				15.83	
				17.50	
	17.86	17.86			
				18.35	
		18.56			
		20.00			
			25.71		
				38.33	

R Right Ear
L Left Ear
M Poorer Ear with Masking
W Poorer Ear without Masking
BC Bone Conduction
B Better Ear

16. This summary tabulation shows the deviations or differences between losses in identical combinations of temperature and humidity, 70°50%(1) and 70°50%(2). Only five of the forty-two audiometric measurements show deviations greater than the 5 decibels normally expected.

Normal Group		Hard-of-Hearing Group			
R	L	M	W	BC	B
.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00
	.00	.00	.00	.00	
				.00	
	.72				.72
					.72
				.84	
1.43		1.43	1.42		
1.43					
2.14					2.14
2.14					
	2.86	2.86	2.85		
				3.33	
	3.57			4.16	
			5.00		5.00
					5.00
	5.71				
6.42			6.42		
		7.15			
		7.15			

17. Re-tests for Subject 12.

Subject 12 was given two re-tests, one at 90°65% and one at 20°80%. He was asked to repeat the test at 90°65% because of a head cold on the date of the original test, and to repeat the test at 20°80% because he had experienced a

congestion of the respiratory system after five minutes exposure to the test room conditions.

The following summary table shows the hearing loss at 90°65%(1) and 90°65%(2).

	90°65%(1) Head Cold	90°65%(2) Without Head Cold	Deviation
Left ear with masking	63.57 db	58.57 db	5.00 db
Without masking	60.00	55.71	4.29
Bone conduction	27.50	33.33	5.83
Right ear	15.71	14.28	1.43

The hearing loss was less on the second test, except for bone conduction, which showed an increase of 5.83 decibels.

One hour before the second test at 20°80%, Subject 12 was given an audiometric measurement outside the test room under ordinary temperature and humidity conditions of the Speech and Hearing Clinic. Five minutes after he entered the test room, he reported that his nose began to run, and after fifteen minutes his nose was completely blocked. He also observed that breathing was difficult.

The following summary tables compare the hearing loss at 20°80%(1), and 20°80%(2), and those on the clinic test and at 20°80%(2).

	$20^{\circ}80\%(1)$	$20^{\circ}80\%(2)$	Deviation
Left ear with masking	75.71 db	80.00 db	4.29 db
Without masking	65.71	67.86	2.15
Bone conduction	50.83	52.50	1.67
Better ear	22.86	22.14	.72
	Clinic	$20^{\circ}80\%(2)$	Deviation
Left ear with masking	57.86	80.00	22.14
Without masking	40.00	67.86	27.86
Bone conduction	18.33	52.50	34.17
Better ear	12.86	22.14	9.28

The deviation or difference between the scores at $20^{\circ}80\%(1)$ and $20^{\circ}80\%(2)$ was less than the 5 db normally expected, but the deviations between the clinic test and the second test at $20^{\circ}80\%$ indicated a definite decrease in hearing acuity in the extreme conditions of temperature and humidity. The subject again experienced a congestion of the respiratory system after five minutes exposure to the test room conditions.

B. Other Physiological Reactions Which May Have Affected the Hearing Acuity.

Physiological reactions measured during the testing period were the rise and fall of oral temperature, the increase and decrease in pulse rate, and the reaction time in responding to the auditory stimuli.

1. Summary of oral temperature before and after test period, measured in degrees.

Subject	70°50%	70°65%	90°65%	90°80%	50°70%	20°80%	70°50%
1	S	S	S	S	98.6° 97.8°	S	S
2	S	97.2° 97.4°	99.0° 98.6°	98.4° 99.2°	97.8° 98.0°	S	S
3	98.4° 98.6°	97.8° 98.2°	98.4° 98.6°	98.6° 99.2°	98.4° 98.0°	98.4° 98.0°	97.8° 98.4°
4	98.4° 98.6°	97.2° 98.2°	97.8° 98.6°	97.8° 98.4°	97.8° 98.4°	98.2° 98.6°	98.2° 98.6°
5	97.6° 97.8°	S	97.6° 99.2°	97.2° 99.0°	S	98.6° 98.2°	S
6	97.6° 98.6°	S	97.4° 98.6°	97.8° 99.0°	98.6° 98.2°	98.2° 97.7°	98.0° 98.6°
7	S	S	97.6° 98.6°	97.8° 99.2°	S	S	S
8	97.8° 98.4°	98.2° 98.4°	98.0° 98.8°	98.6° 99.0°	98.6° 98.4°	98.6° 97.4°	S
9	S	97.8° 98.4°	97.8° 98.4°	97.8° 98.8°	98.6° 97.8°	98.6° 98.2°	S
10	98.2° 98.6°	98.4° 98.6°	98.6° 99.0°	S	S	S	S
11	97.6° 97.8°	S	97.8° 98.6°	98.0° 98.6°	98.4° 97.8°	97.8° 97.6°	97.8° 98.6°
12	97.4° 98.2°	97.4° 98.6°	S	97.8° 98.4°	97.4° 98.6°	97.6° 97.4°	S
13	S	S	98.2° 99.0°	98.6° 99.0°	S	98.6° 97.4°	S
14	97.6° 98.2°	97.4° 98.2°	97.6° 98.6°	97.0° 98.6°	97.8° 98.4°	97.8° 98.6°	97.6° 97.8°

S = Same temperature before and after test period.

At 70°50% (Col. 2)

Nine of the fourteen subjects had rises in temperature from .2° to 1.0° with an average of .37°.

Five showed no change.

At 70°65% (Col. 3)

Eight of the fourteen subjects had rises in temperature from .2° to 1.0° with an average of .58°.

Six showed no change.

At 90°65% (Col. 4)

Eleven of the fourteen subjects had rises in temperature from .2° to 1.6° with an average of .76°.

One had a drop in temperature of .4°.

Two showed no change.

At 90°80% (Col. 5)

Twelve of the fourteen subjects had rises in temperature from .4° to 1.8° with an average of .92°.

Two showed no change.

At 50°70% (Col. 6)

Four of the fourteen subjects had rises in temperature from .2° to .8° with an average of .65°.

Six had drops in temperature from .2° to 1.2° with an average of .53°.

Four showed no change.

At 20°80% (Col. 7)

Two of the fourteen subjects had rises in temperature from .4° to .8° with an average of .60°.

Eight had drops in temperature from .2° to 1.2° with an average of .53°.

Four showed no change.

At 70°50% (Col. 8)

Five of the fourteen subjects had rises in temperature from .2° to .8° with an average of .52°.

Nine showed no change.

Summary Tabulation

Test	Rise Degrees		Drop Degrees		Same
70°50%	9	.37°			5
70°65%	8	.58°			6
90°65%	11	.76°	1	.40°	2
90°80%	12	.92°			2
50°70%	4	.65°	6	.53°	4
20°80%	2	.60°	8	.53°	4
70°50%	5	.52°			9

2. Summary of pulse rate before and after test period.

Subject	70°50%	70°65%	90°65%	90°80%	50°70%	20°80%	70°50%
1	84 80	S	96 100	89 100	92 72	80 76	80 84
2	100 76	80 76	74 86	100 96	80 74	90 82	96 72
3	S	76 64	72 80	S	88 64	72 64	76 68
4	76 74	76 74	84 90	72 96	78 66	92 66	90 78
5	60 64	S	68 74	S	72 68	S	S
6	100 84	96 86	88 82	89 94	96 68	76 68	79 74
7	100 84	96 72	96 92	92 100	84 80	88 84	92 80
8	80 76	S	86 80	84 96	68 72	74 68	76 78
9	S	64 68	68 76	74 80	S	74 64	80 76
10	80 70	82 78	82 90	S	S	80 74	S
11	84 74	84 90	S	94 98	86 76	96 92	90 80
12	80 68	80 68	68 72	80 72	76 60	72 68	76 64
13	84 72	84 88	88 74	86 88	64 70	96 68	S
14	S	S	72 76	72 80	S	76 84	S

S = Same pulse rate before and after test period.

At 70°50%(1) (Col. 2)

One of the fourteen subjects had a rise in pulse rate of 4 points.

Ten had drops in pulse rate ranging from 2 to 24, with an average of 11 points.

Three showed no change.

At 70°65% (Col. 3)

Three of the fourteen subjects had rises in pulse rate ranging from 2 to 6 points, with an average of 4 points.

Seven had drops in pulse rate ranging from 2 to 14 points, with an average of 8.2 points.

Four showed no change.

At 90°65% (Col. 4)

Eight of the fourteen subjects had rises in pulse rate ranging from 4 to 12 points, with an average of 6.2 points.

Five had drops ranging from 4 to 14 points, with an average of 5.6 points.

One showed no change.

At 90°80% (Col. 5)

Nine of the fourteen subjects had rises in pulse rate ranging from 2 to 14 points, with an average of 7.3 points.

Two had drops of 4 and 8 points, with an average of 6 points.

Three showed no change.

At 50°70% (Col. 6)

Two of the fourteen subjects had rises in pulse rate of 4 and 6 points, with an average of 5 points.

Nine had drops in pulse rate ranging from 4 to 28 points, with an average of 12.66 points.

Three showed no change.

At 20°80% (Col. 7)

One of the fourteen subjects had a rise in pulse rate of 8 points.

Twelve had drops in pulse rate ranging from 4 to 28 points, with an average of 9.66 points.

One showed no change.

At 70°50%(2) (Col. 8)

Two of the fourteen subjects had rises in pulse rate of 2 and 6 points, with an average of 4 points.

Eight had drops in pulse rate ranging from 4 to 24 points, with an average of 10.87 points.

Four showed no change.

Summary Tabulation

Test	Rise		Drop		No Change
	No.	Points	No.	Points	
70°50%(1)	1	4.0	10	11.00	3
70°65%	3	4.0	7	8.20	4
90°65%	8	6.2	5	5.20	1
90°80%	9	7.3	2	6.00	3
50°70%	2	5.0	9	12.66	3
20°80%	1	8.0	12	9.66	1
70°50%(2)	2	4.0	8	10.87	4

3. Summary of signal light responses to auditory stimuli, measured in seconds.

Subject	70°50%	70°65%	90°65%	90°80%	50°70%	20°80%	70°50%
		Sec.	Sec.	Sec.			
1	ND	ND	5-9	9-12	ND	ND	ND
2	ND	ND	ND	8-10	ND	ND	ND
3	ND	ND	F	6-10	ND	ND	F
4	ND	ND	3-5	F	ND	F	ND
5	ND	ND	5-8	5-12	ND	ND	ND
6	ND	ND	F	9-12	ND	ND	ND
7	ND	ND	6-10	8-10	ND	ND	ND
8	ND	8-12	12-15	12-18	3-5	12-18	ND
9	ND	ND	4-6	8-10	ND	3-7	ND
10	ND	ND	4-8	5-8	ND	ND	ND
11	ND	ND	4-7	5-10	ND	6-10	ND
12	ND	ND	3-5	5-8	ND	6-8	ND
13	ND	ND	ND	5-8	ND	ND	ND
14	ND	ND	ND	6-8	ND	F	ND

ND = No Delay

F = Flickering (Intermittent)

At 70°50%(1) (Col. 2)

Fourteen out of fourteen subjects had No Delay in signal light response to auditory stimuli.

At 70°65% (Col. 3)

Thirteen of the fourteen subjects had No Delay.

One had delays ranging from 8 to 12 seconds, an average delay of 10 seconds.

At 90°65% (Col. 4)

Three of the fourteen subjects had No Delay.

Nine subjects had delays ranging from 3 to 15 seconds. Average delay, 6.61 seconds.

Two had flickering light (intermittent).

At 90°80% (Col. 5)

Thirteen of the fourteen subjects had delays ranging from 5 to 18 seconds. Average delay, 8.57 seconds.

One had flickering lights (intermittent).

At 50°70% (Col. 6)

Thirteen of the fourteen subjects had No Delay.

One had delays ranging from 3 to 5 seconds. Average delay, 4 seconds.

At 20°80% (Col. 7)

Eight of the fourteen subjects had No Delay.

Four had delays ranging from 3 to 18 seconds. Average delay 8.75.

Two had flickering lights (intermittent).

At 70°50% (Col. 8)

Thirteen of the fourteen subjects had No Delay.

One had flickering lights (intermittent).

Summary Tabulation

Test	No Delay	Delay	Seconds	Flickering Lights
70°50%	14	0	--	0
70°65%	13	1	10.00	0
90°65%	3	9	6.61	2
90°80%	0	13	8.57	1
50°70%	13	1	4.00	0
20°80%	8	4	8.75	2
70°50%	13	0	--	0

Subject 8 had delayed signal lights on each test except 70°50%(1) and (2). See Medical History, p. 189.

C. Observations and Subjective Evaluations of the Subjects and the Operator.

Subjective evaluations made during the testing period were concerned with the feelings of well being of the subjects, with the amount of rest they had had the night before the test, with unusual activities which might have affected the test results, and with the comfort of the subjects in the test room at each of the seven combinations of temperature and humidity. The observations of the operator were concerned with clues to the restlessness or relaxation of the subjects, with on-set of sweating or shivering, with changes in skin coloring, and with alertness or inattention of the subjects during the audiometric tests.

The subjects were all cooperative and enthusiastic during the experiment. With very few exceptions they rated themselves as feeling above average, although one reported extreme fatigue after an unexpected trip, one was nervous because he had overslept and was late for his first test, and a third felt that he was coming down with flu.

Despite the heavy schedule of events in the closing weeks of the school year, the subjects were fairly consistent in the amount of rest they had had the night before the test. Subject 3, however, reported that he had slept only four hours before he took the test at $70^{\circ}50\%(2)$. But a comparison of the scores at $70^{\circ}50\%(1)$ and $70^{\circ}50\%(2)$ shows that he lost

only an average of 2.14 decibels on the measurement for the right ear, and 5.71 decibels on the measurement of the left ear. Subject 4, on the other hand, showed no deviation or difference between test scores at $70^{\circ}50\%$(1) and $70^{\circ}50\%$(2), although he had gone to bed at 4:00 a.m. the morning before the second $70^{\circ}50\%$ test.

The following tabulation of the responses to the question concerning the comfort of the subjects in the test room shows that the combinations $70^{\circ}50\%$ and $70^{\circ}65\%$ were the most comfortable, with $20^{\circ}80\%$, $90^{\circ}80\%$ and $90^{\circ}65\%$ the least comfortable. Nine subjects were comfortable at $50^{\circ}70\%$, while five reported discomfort. There was no obvious difference between the hard-of-hearing group and the normal group.

"Were You Comfortable in the Test Room?"

Subject	$70^{\circ}50\%$	$70^{\circ}65\%$	$90^{\circ}65\%$	$90^{\circ}80\%$	$50^{\circ}70\%$	$20^{\circ}80\%$	$70^{\circ}50\%$
Normal:							
1	Yes	Yes	No	No	No	No	Yes
2	Yes	Yes	No	No	Yes	No	No
3	Yes	Yes	No	No	Yes	No	Yes
4	Yes	Yes	No	No	No	No	Yes
5	Yes	Yes	No	No	Yes	No	Yes
6	Yes	Yes	No	No	Yes	No	Yes
7	Yes	Yes	No	No	Yes	No	Yes

Subject	"Were You Comfortable in the Test Room?" 70°50%	70°65%	90°65%	90°80%	50°70%	20°80%	70°50%
Hard-of-Hearing:							
8	Yes	Yes	No	No	No	No	Yes
9	Yes	Yes	No	No	No	No	Yes
10	Yes	Yes	No	No	No	No	Yes
11	Yes	Yes	No	No	Yes	No	Yes
12	Yes	Yes	No	No	Yes	No	Yes
13	Yes	Yes	Yes	No	Yes	No	Yes
14	Yes	No	No	No	Yes	No	Yes

The subjects seemed to be more relaxed at the combinations 50°70% and 70°50% than at any of the other combinations, while the combinations 90°80% and 90°65% produced more restlessness than did the other tests. In the latter tests the subjects used such terms as "angry," "closed in," and "all cramped up inside" to describe how they felt.

At 90°80% and 90°65% inattention was noted. Several subjects, both normal and hard-of-hearing, seemed to fall asleep during the latter part of the test, making it necessary to increase the intensity to as much as 30 decibels to arouse them.

At 90°80% and 90°65% profuse sweating was common to all subjects. Subject 7 had marked flushing of the skin on the neck and underjaw. The eyes of Subject 11 were bloodshot when he left the test room.

The combination 20°80%, at the other extreme, produced shivering, chilling, rhinitis and nasal congestions to varying degrees. Subject 12 experienced a congestion of the

respiratory system after only five minutes in the test room. When the test was repeated two weeks later, again he experienced the congestion, though slightly less rapidly. Subject 13 developed a headache after twenty minutes in the test room, reporting that this type of reaction was common to him in cold, wet weather.

During the period of April 11th to 15th, the outside weather conditions seemed to exert some influence on the feelings of well being of some of the subjects, and upon the hearing acuity on the tests taken, but these effects were in the opposite direction in different subjects. Three of the fourteen subjects had maximum losses at 70°65% during the four-day period, while three had minimum losses at 70°65% during the same period.

In general, the observations and subjective evaluations of the subjects and the operator parallel the recorded physiological reactions (oral temperature, pulse rate, and signal light responses to auditory stimuli) and the changes in hearing acuity at various combinations of temperature and humidity.

CHAPTER V

CONCLUSIONS

Within the limits of the present study, the following conclusions seem to be justified:

1. In identical combinations of temperature and relative humidity, the subjects showed (in thirty-seven out of forty-two audiometric measurements) no significant difference in hearing acuity.
2. At the extreme limits of temperature and relative humidity, the subjects showed (in thirty-three out of forty-two audiometric measurements) hearing losses greater than the 5 decibels normally expected on successive tests for the same individual.
3. In general, hearing acuity is highest at a temperature of 50°F. with a relative humidity of 70 per cent (twenty-seven of forty-two measurements).
4. In general, hearing acuity is lowest at a temperature of 20°F. with an accompanying relative humidity of 80 per cent (eighteen of forty-two measurements), or at 90°F. with a relative humidity of 80 per cent.

5. According to Huntington's theory, the best mental work is done at 50°F. with a relative humidity of 70 per cent. Auditory acuity was highest in twenty-seven of forty-two measurements and second highest in eight of forty-two measurements in this combination, a fact which may account for the quality of the mental work.
6. According to Huntington's theory, the best physical work is done at 70°F with a relative humidity range of 50 to 65 per cent. Auditory acuity was highest in eight of forty-two measurements, and second highest in twenty-eight measurements in the combinations of 70°F. with a relative humidity of 50 per cent and 70°F. with a relative humidity of 65 per cent.
7. There was no significant difference in hearing acuity (more than 5 decibels) between 50°F. with a relative humidity of 70 per cent, on the one hand, and 70°F. with a relative humidity range of 50 to 65 per cent.

In sum, the optimum temperature and humidity combination for hearing acuity, according to the results of this study, is 50°F. with a relative humidity of 70 per cent, and the combination 70°F. with a humidity range of 50 to 65 per cent next best.

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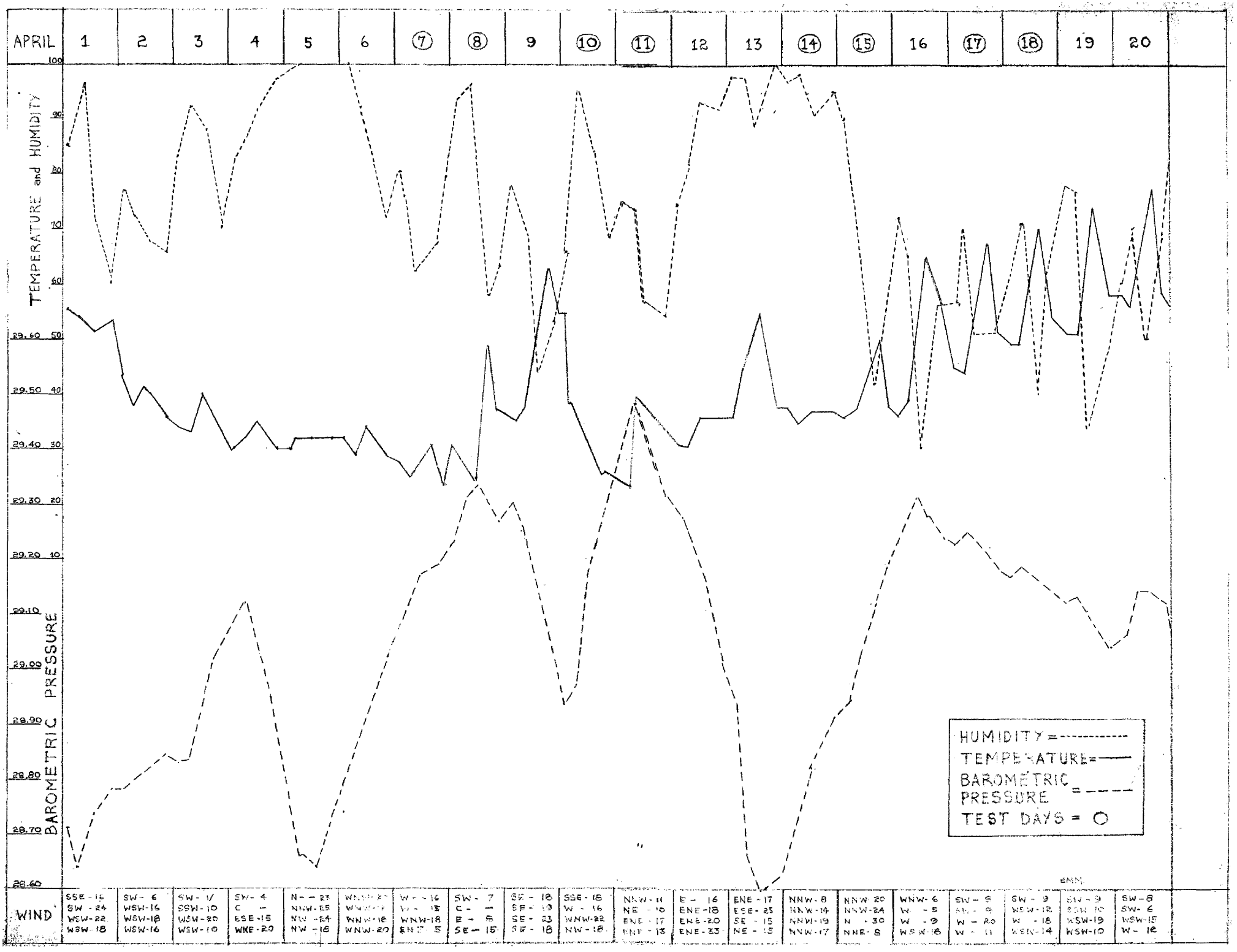
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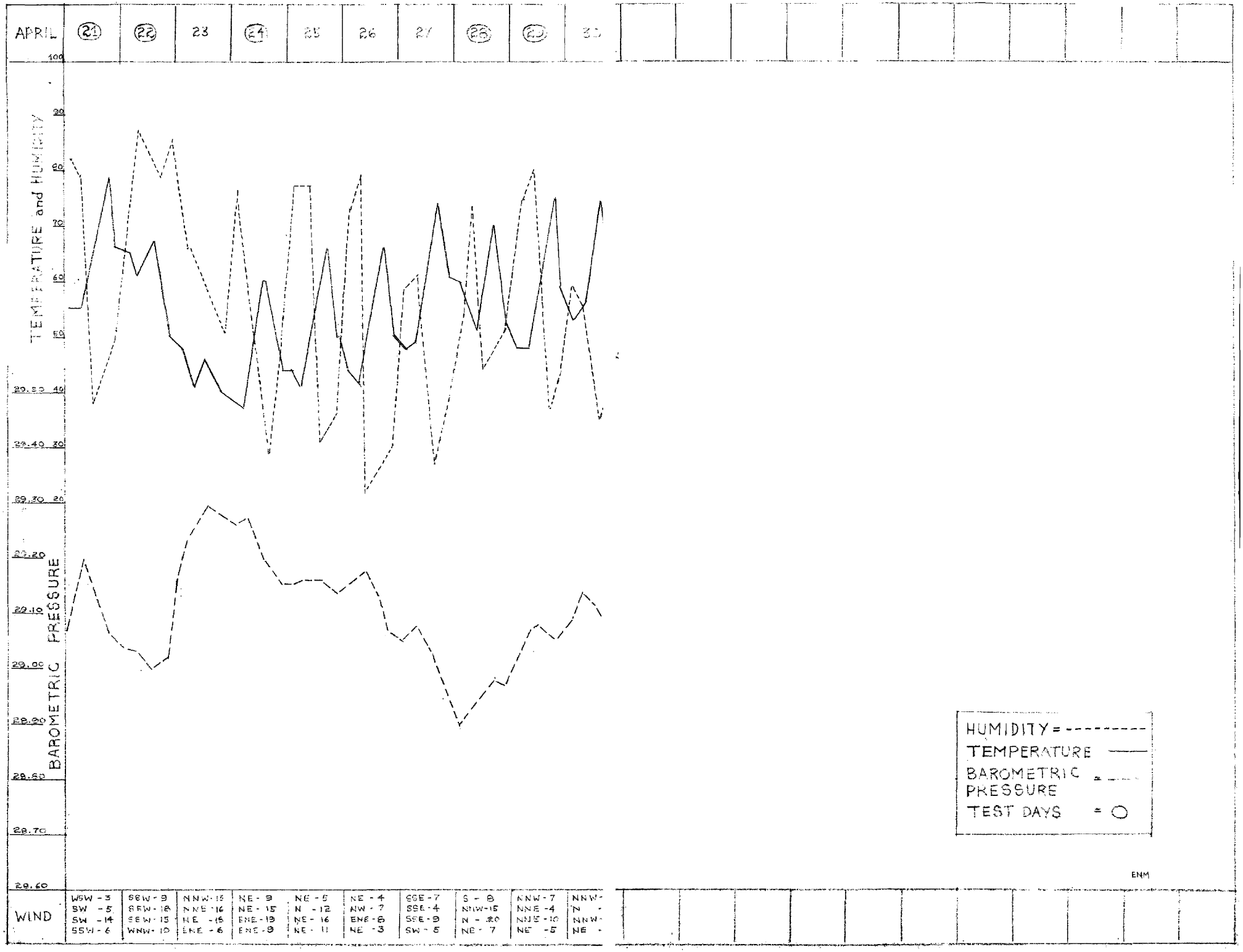
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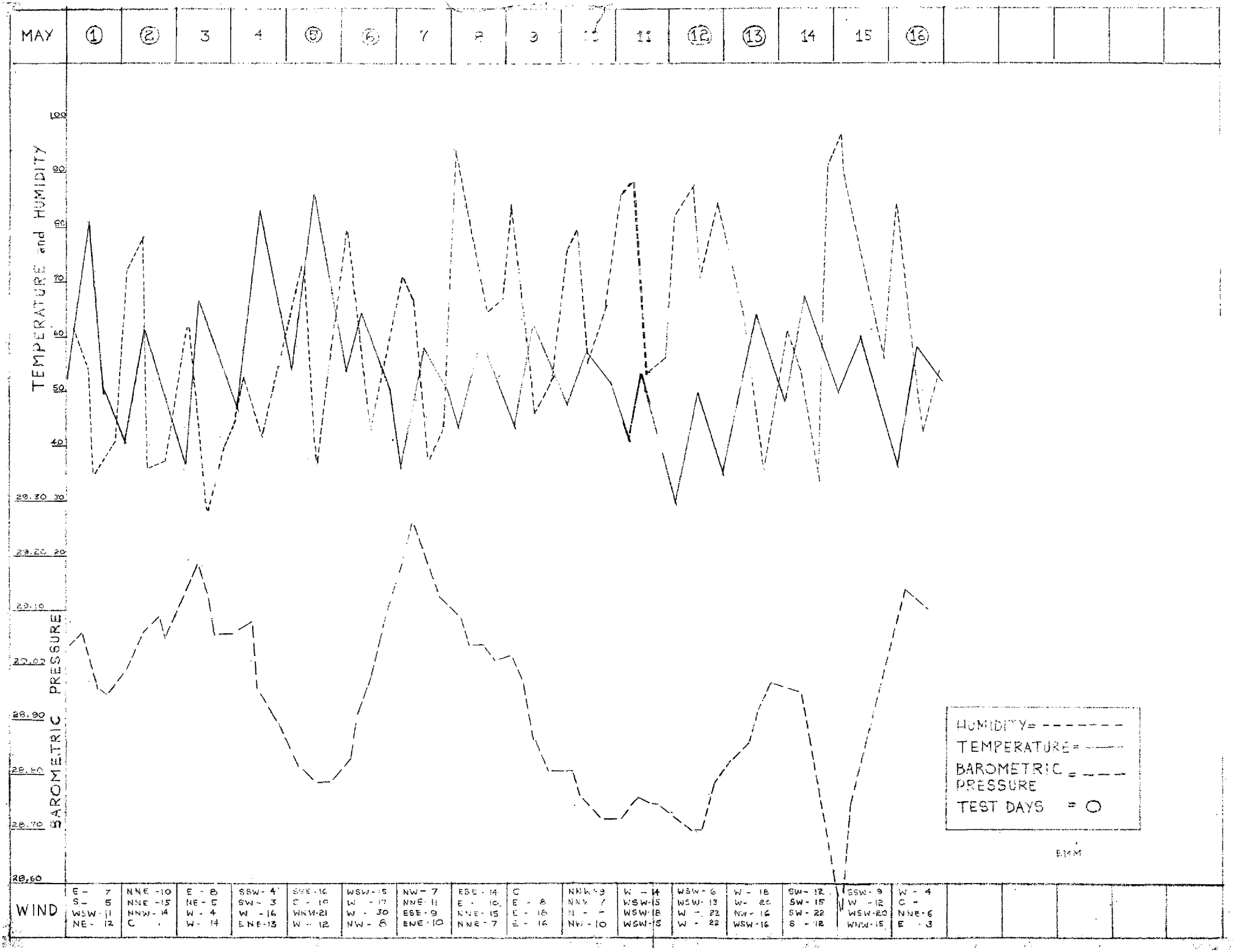
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